

THE ZOOLOGIST.

THIRD SERIES.

VOL. IV.]

MAY, 1880.

[No. 41.

REPORT ON THE MIGRATION OF BIRDS IN THE AUTUMN OF 1879.†

BY JOHN A. HARVIE-BROWN AND JOHN CORDEAUX.

EAST COAST OF SCOTLAND.

PRINTED forms of enquiry and letters of instructions were sent to twenty-six lighthouses on the east coast of Scotland. Thirteen stations have sent in returns, and thirteen have either sent in none, or have returned blank forms, owing to unusual scarcity of birds. The stations from which co-operation was asked are the following, commencing with the most northerly. Those from which returns have been received are marked with a *.

*North Unst, Shetland; white and red sectors, fixed. Robert Burnett.

Whalsey Skerries, Shetland; white, revolving every minute.

Bressay Sound, Shetland; red and white alternately, rev. every minute.

*Sumburgh Head, Shetland; white, fixed. William Anderson.

*North Ronaldshay, Orkney; white, flash every 10 seconds. John Tulloch.
Start Point, Orkney; red, fixed.

*Auskerry, Orkney; white, fixed. Charles C. Irvine.

† I would here direct attention to another paper of mine bearing upon this subject, which was read at the meeting of the Glasgow Natural History Society on Sept. 30th, 1879, and forms part of its 'Proceedings' for the Session 1879-80, now in the press. It forms a Report upon Migration of 1878, Journal of the severe winter of 1879-80, and Observations on the effects of the weather, under the different species of Mammals and Birds noticed. I read a similar Report on 1879-80 at the meeting of the same Society in March last.—J. A. H.-B.

- *Hoy Sound (Low), Orkney ; white, fixed. Alex. Harp.
- ,, (High) Orkney ; red and white sectors, fixed. W. Gordon.
- Cantick Head, Orkney ; white, revolving every minute.
- *Pentland Skerries, Orkney ; white, fixed. D. M'Donald.
- *Dunnet Head, Caithness ; white, fixed. George M'Lachlan.
- Holborn Head, Caithness ; white and red, flash every 10 sec. D. Charleson.
- *Noss Head, Caithness ; white and red, revolving every $\frac{1}{2}$ m. Alex. Creig.
- *Tarbet Ness, E. Ross-shire ; white, int. visible every $2\frac{1}{2}$ m. W. Davidson.
- Cromarty, E. Cromarty ; red, fixed. Robert S. Ritson.
- Chanoury Point, Elgin ; white and red sectors, revolving every minute.
- Covesea Skerries, Elgin ; white and red sectors, revolving every minute.
- Kinnaird Head, Aberdeen ; white and red sectors, fixed. F. Harvey.
- Buchan Ness, Aberdeen ; white, flash every 5 seconds. Thomas Gallie.
- *Girdleness, Aberdeen ; white, fixed. Wm. Gulcher.
- Montrose Ness, Forfar ; white, fixed. Patrick E. Reid.
- *Bell Rock, off Coast of Fife ; white and red revolving. James Jack.
- *Isle of May, Firth of Forth ; white, fixed. Joseph Agnew.
- *Inch Keith, Firth of Forth ; white, revolving every minute. R. Grierson.
- St. Abbs Head, Berwick ; white, flash every 10 seconds. Robert Seater.

A general scarcity of birds is reported by a great majority of the observers on our east coast, which partly accounts for the absence of returns from several stations. Those sent in have been carefully prepared by the various reporters so far as materials allowed. Excluding Swans, Geese, Ducks, and Rock-birds, notes have been made on about twenty-eight different species.

SEPARATE REPORT OF EACH SPECIES OBSERVED.

At North Ronaldshay, an Owl—species unknown, but probably the Short-eared Owl, *Asio accipitrinus*—was seen on Nov. 3rd, flying south, at 10 a.m.; and at Dunnet Head a Horned Owl, also probably of the same species, struck three times, but got away. This was at 6 p.m.

From Pentland Skerries we have all the records of hawks. Two early records (July 7th and 14th) may refer to autumn migration or not. Thus, "a black hawk" was seen on July 7th at 3 p.m., and on the 14th another of the same at 7 p.m. On Sept. 17th one hawk struck at 11.30 p.m. The species is probably the Sparrowhawk, *Accipiter nisus*.

Accounts forwarded by other correspondents, however, show that Hobbies (*Falco subbuteo*, Linn.), visited the Lewis in some

numbers this year.† At Sumburgh Head the appearance of a White-tailed Eagle is recorded, but is only of local interest, as these birds are known to breed near that station. That a migration, however, does take place amongst Eagles, and mostly of this species, is undoubted. Mr. D. Dewar, an experienced ornithologist, writes me:—“ Every winter, for this long time back, when we have a strong east wind in November, Eagles and Rough-legged Buzzards appear over Loch Tay. In November, this year, I saw four Eagles together, all White-tailed, and three Rough-legged Buzzards along with them.”

SWIFT, *Cypselus apus*.—Only one at Sumburgh Head on May 25th, doubtless on the spring migration. Two were seen at 10 a.m., wind light S.W., breeze and haze. “ Swifts, however, do not breed in Shetland” (*vide* Saxby’s ‘Birds of Shetland,’ p. 147).

SWALLOW, *Hirundo rustica*.—I have returns from four stations, Sumburgh Head, Auskerry, Tarbet Ness, and Isle of May. At the northernmost station (Sumburgh Head) “ a number were seen flying about,” at 11 a.m., wind at W.S.W., fresh and hazy. But this record was on June 12th, so probably refers to the spring migration. Their earliest appearance noted is August 21st, when four struck at Auskerry at 1 a.m., wind S.E., strong with fog; the latest Oct. 27th, when two were killed at Tarbet Ness at 7.10 p.m., wind N.W., light with fog. This shows migration between Aug. 21st and Oct. 27th. A “rush” appears to have taken place at the Isle of May on Sept. 19th, at 2 a.m., wind light E. with fog, when a flock of young birds was seen and four of them were wounded against the glass. Swallows migrate in August and September with an E. to S.E. wind, light to strong. In October my only record at Tarbet Ness gives wind N.W., light with fog. When the wind has been N.W., S.E. or E. there has been fog; when, in summer, at Sumburgh Head, W.S.W., there has been haze and rain. The last Swallow was seen in Berwickshire by Mr. J. Hardy on the 30th Sept. 1879.

MARTIN, *Hirundo urbica*.—From Pentland Skerries one record in which this species is distinguished from the Swallow. On August 25th one struck at 2.30 p.m. during a light W. wind with haze. The last was seen in Berwickshire by Mr. J. Hardy on the 3rd October, 1879.

† I have referred more fully to this in my “Report on Scottish Ornithology” for the Nat. Hist. Soc. of Glasgow for 1879-80.—J. A. H.-B.

WREN, *Troglodytes europaeus*.—At North Ronaldshay five seen during the day-time on Nov. 21st, fresh breeze (direction not noted) with haze. Reported as usually appearing in large numbers at Auskerry, but the above-mentioned were the only ones seen.

GOLDCREST, *Regulus cristatus*.—The almost total absence of this species is specially remarked at the Isle of May. Usually they are abundant. These birds were decidedly scarce in Scotland throughout the summer.

ROBIN, *Erythaca rubecula*.—Only two records of this species on the east coast. At Tarbet Ness one was killed on August 6th at 10 p.m., wind light E. breeze, fog and rain; and at Inch Keith one struck on August 16th at 11.30 p.m., in similar weather, but with wind light W.

WHEATEAR, *Saxicola oenanthe*.—The most northerly station of the two recorded is Pentland Skerries, and to the south the Bell Rock. Between Sept. 7th—when great numbers struck and were lost at the latter station, and birds continued passing or flying round lantern between midnight and dawn, wind S.E. and variable, fog and haze—and Sept. 17th, Wheatears or "Stone-chats" were on passage. If any rush took place it was between Sept. 7th and 11th, on which latter day fourteen were seen and two killed. Winds veered from S. and S.E. on Sept. 9th and 7th, to W. and S.W. on the 11th, 13th and 17th. All the birds passed at night between 8 p.m. and dawn.

TITMICE.—At only one station were Titmice observed on our east coast, viz., at the Isle of May, were some were seen on Sept. 15th at 10 a.m., wind light W. with haze. From Auskerry, however, there is the general report that they are in most years abundant there, though none have been seen this season.

SONG THRUSH, *Turdus musicus*.—Recorded from a number of stations from North Ronaldshay in the north to Auskerry, Pentland Skerries, Dunnet Head, Noss Head, Girdleness, and Bell Rock in the south. The greatest numbers noted were at Pentland Skerries, but great numbers also were noted at North Ronaldshay and the Bell Rock, where many "struck and were lost." Their earliest appearance recorded is on Sept. 16th, when four struck at Noss Head between 8 p.m. and 10 p.m., wind S., moderate with haze. The latest date is Oct. 25th, when numbers, along with Blackbirds, struck at North Ronaldshay. The time

thus occupied was from Sept. 16th to Oct. 25th. A rush took place during October, and the greatest rush, perhaps, between Oct. 14th and 25th. At North Ronaldshay, on Oct. 1st, numbers struck, along with Blackbirds, and were flying about all night. Others seen at Girdleness, the Bell Rock, at Pentland Skerries, and Dunnet Head. Thrushes migrated when the wind was between E. through S.E., S.S.W. to N.W., but principally when southerly. Fog, haze, and rain on all the dates given. Time of migration, after dark and before dawn at all dates.

BLACKBIRD, *Turdus merula*.—Appeared at North Ronaldshay and the Bell Rock between Oct. 1st and Nov. 25th. A rush during this time recorded on three dates:—Oct. 1st, "Numbers flying about all night," at North Ronaldshay, wind S.E., strong, "along with Thrushes." Oct. 14th, four (two males and two females) killed; number flying about between 3 a.m. and dawn; wind N.E., fresh, with haze and rain. Nov. 25th, numbers, along with Thrushes, flying about all night; wind light E. breeze, haze.

RING OUZEL (or "Mountain Blackbird"), *Turdus torquatus*.—Reported from Sumburgh Head only, where one struck at 4 a.m.; wind light N. at 5 a.m., S.W. gale at 4 p.m.; weather clear. A number of the same species were seen in the country about the same time, and supposed to be young birds. At Auskerry, where they generally pass in large numbers, none were observed.

Besides the above, "large Thrushes," probably Fieldfares,† passed or were caught at Auskerry, in October; four on the 15th between 1 and 4 a.m., wind light N., clear; six on the 16th between 2 and 4 a.m., wind S.S.W., strong, haze; and two on the 22nd at 3 a.m., wind strong S.W., and haze. Large numbers struck the lantern at the Bell Rock, and were lost in the sea between midnight and dawn on Sept. 7th, and again at the same station on Oct. 14th, between 3 a.m. and dawn. These were mixed in flocks of Blackbirds, Thrushes, and "various" other species.

The great scarcity of Thrushes in Scotland all summer was caused by the severe winter of 1878-79 and late spring of 1879, a consequent "crowding down" upon lower latitudes taking place during that breeding season. I have referred very fully to this in my first Report on Scottish Ornithology for the Natural History Society of Glasgow for 1878-79 (now in MS., ready for press),

† Afterwards identified as such by the head, wings and tail sent in later communication.

read Sept. 30th, 1879. This scarcity is still felt. In the birch-woods of the west coast I saw small flocks on Oct. 28th, 1879.

ROOK, *Corvus frugilegus*.—At Sumburgh Head numbers were seen about 9 a.m. on Nov. 2nd, wind N.N.W., strong to fresh, with sleet and snow showers. "Rooks do not breed in Shetland, but are often seen in the spring time, but very seldom in the fall, crossing, as is supposed, between Norway and Scotland." At Dunnet Head about 100 Rooks, mostly young birds, were seen at 12 noon, with fresh breeze from S.E. to S.W.

STARLING, *Sturnus vulgaris*.—Noted at only two stations. At Pentland Skerries on October 19th six struck between 6 p.m. and 4 a.m., wind S.W. and rain; on the 26th one at 8 p.m., wind W., and clear; and on Nov. 20th two at 6 a.m., wind S.W., strong and haze. At Dunnet Head, on Oct. 20th, seven struck and four were killed at night, wind N.W. and N.E., haze.

SISKIN, *Carduelis spinus*.—At Inch Keith three young birds struck at 1 a.m. on Sept. 16th, wind light W., fog.

LARK, *Alauda arvensis*.—Pretty generally recorded, but scarcer than usual; the northernmost station Pentland Skerries. They are also noted at Tarbet Ness and Girdleness. The most counted was thirty-six at Pentland Skerries between 5 p.m. and 4 a.m. on October 13th-14th, and the next largest number was sixteen, on Sept. 15th, between 8 and 10 p.m. Their earliest appearance was on August 16th, when four struck at midnight at Tarbet Ness, wind light S.E. and haze; the latest Nov. 19th, when nine struck (four killed) at the same station at 8.10 p.m., wind S.W., light and haze. The time occupied is thus between August 16th and Nov. 19th. A rush took place between Oct. 13th and 14th, or say about the middle of October, and again about November 19th at Pentland Skerries, Tarbet Ness, and Girdleness.

Larks migrated or came most under notice in S.W. winds, but also in S.E., N.E. (as at Pentland Skerries, when thirty-six were seen), and W. Our data from the Scotch coasts are too limited this year to admit of conclusions, unaided by the English returns. Haze and fog are recorded on all the days noticed. All records give hours of passing at night from 5 p.m. in October, and from 8.10 p.m. in November till 4 or 5 a.m.

WOODPECKER, *Picus (major?)*.—At Inch Keith two struck and an adult bird was killed at 9 p.m. on Sept. 15th, wind W., light breeze and fog.

LAPWING, *Vanellus cristatus*.—Reported to have left the vicinity of Hoy Sound in the third week of September. At Auskerry thirty or forty were seen about 3 p.m. on Sept. 11th, wind light W. and haze, and at Tarbet Ness a large flock was seen at 11 a.m., when the wind was N.W., light and haze on Oct. 12th.

PLOVER, *Charadrius pluvialis*.—At Pentland Skerries a flock was seen at 1.15 a.m. on Sept. 3rd, wind S.W., almost calm, with fog, and another flock at 2 p.m. on Dec. 7th, wind N.W. and clear. These represent earliest and latest dates. At Dunnet Head about 160 Plovers passed with S.E. wind and rain. At Tarbet Ness a large flock seen at 4 p.m., wind N.W., fresh and haze on Oct. 12th. Plovers remained unusually late on the high hills of Perthshire this autumn. On Oct. 15th I saw three on the hills around Glen Queich, and two flocks on the 16th. On the 14th was a snowstorm and ice a quarter of an inch in thickness on hill puddles.

HERON, *Ardea cinerea*.—At Girdleness on October 23rd two Herons were seen at 3.30 p.m., wind S.W., clear.

CURLEW, *Numenius arquata*.—Only three records, one of which no doubt refers to local migration or to late spring or summer. On June 29th a flock was seen at Pentland Skerries at 7.40 p.m. At Sumburgh Head, on July 30th, "a number crying very loud" were heard about 11 a.m., wind W.S.W. (gale on Aug. 1st), with haze and rain. At Pentland Skerries, on Dec. 11th, a flock was noted at 7.40 p.m. during light W. wind and clear. Did the migration last from July 30th to Dec. 11th? Curlews appear to migrate from early dawn to dusk, as far as records show. These birds were nearly a month late in arriving on our coast in Stirlingshire.

SANDPIPER (sp.?).—At Pentland Skerries three struck and were killed; wind strong S.W. and haze.

WOODCOCK, *Scolopax rusticola*.—The most northerly station was North Ronaldshay. Thence southward, but nowhere in large numbers, seen or struck at Auskerry, Pentland Skerries, Dunnet Head, Tarbet Ness, Girdleness, and Isle of May. The largest number seen at any station at the same time being five at Tarbet Ness on December 3rd. A single bird is noted at Dunnet Head as early as Sept. 17th. None again till Oct. 15th, when one was killed at North Ronaldshay at 9 p.m., wind N.E., moderate, with sleet. The latest recorded was Dec. 3rd, when, as related above, five were seen at Tarbet Ness at 11.30 a.m., wind strong W., with

snow. The length of time occupied in migration was between Sept. 17th and Dec. 3rd. "Rushes" of migrants took place between Oct. 15th and 21st, but the reports are very meagre, being in most cases instanced by single birds striking at North Ronaldshay, Auskerry, Pentland Skerries, and Isle of May. Again a rush between Nov. 14th and 19th at North Ronaldshay and Girdleness; and again between Dec. 1st and 3rd at North Ronaldshay and Tarbet Ness. In two cases only have more than single birds been recorded. The migration took place principally when the wind was between S. and W.; but I have records of their flights also in strong N. wind with snow, on Dec. 1st, at Tarbet Ness; in N.E., moderate breeze with sleet, on Oct. 15th at North Ronaldshay; and again, with an E. light breeze and clear, on Dec. 21st, at the same station. When the wind has been S.W. or W., there has been fog or haze; when S., rain, as in November, on the 14th and 15th. Woodcocks appear to migrate principally at night, and are observed during the hours between evening dusk and morning grey, or, in other words, between 7.30 p.m. and 5 a.m. Exceptions occur, as at 11 a.m. at North Ronaldshay, 11.30 a.m. at Tarbet Ness, 2 p.m. at North Ronaldshay, and 3.30 p.m. at Girdleness; these last being all in daylight. A flight came inland in Stirlingshire about Nov. 22nd, on which day a party of five guns, of which party I was one, killed eighteen in Torwood Covers.

SNIPE, *Gallinago scolopacinga*.—At the Isle of May one was seen at 10 a.m. on August 6th, with light S.E. wind, fog and rain. Snipe scarce or much scattered, owing to wet season. Entirely disappeared from inland localities when the hard frost of beginning of December set in, and few returned all winter.

WATER RAIL, *Rallus aquaticus*.—One record at Girdleness; on August 17th, one was seen at 8 p.m., wind E. with rain.

GREY GEESE.—At Dunnet Head, on Sept. 3rd, thirteen Grey Geese were seen "going north" at 3 p.m., wind S.E., fresh, haze and rain.

BERNACLE GOOSE, *Bernicla brenta*.—At Dunnet Head a mixed flock of old and young (twenty-five) seen going W. on Sept. 7th, and five more on the 14th, during the day, wind light W. Fog on the 7th; clear on the 14th. *Anatidæ* were a month earlier in appearing on Loch Tay in the autumn of 1879. Geese were reported as unusually abundant from many localities.

SWANS.—Three Swans seen at North Ronaldshay flying south at 2.30 p.m., with W.N.W. fresh wind and clear, and again at same place at 9.30 a.m., on Nov. 27th, swimming on the water; wind strong N.E., and clear. At Pentland Skerries eight were seen at 2 p.m. on Oct. 26th; wind light W. and clear. At Dunnet Head three old and one young seen going S.W., at 1 p.m., breeze light, on Sept 14th; and three old birds again on Sept. 22nd.

DUCKS.—At Tarbet Ness a large flock of ducks passed inland at 10 a.m., with a N. gale and snow, on Nov. 12th. At Girdleness, two ducks seen at 4.40 a.m., wind S.W., and haze, on Oct. 16th. At Tarbet Ness a large flock seen at 9.15 a.m., wind W., strong and snow, on Dec. 5th. At Dunnet Head seven ducks (Widgeon) stayed on the lake three days from Oct. 25th; arrived with W. to N.W. breeze and cloudy.

GUILLEMOT, *Uria troile*.—At Pentland Skerries a flock seen on June 25th, at 7.15 p.m.; wind E.N.E., and light haze. (Compare with notes on W. coast at Cape Wrath and elsewhere.)

PUFFIN, *Morman fratercula*.—At North Unst innumerable Puffins seen on evening of April 24th.

COMMON SKUA (or "Bonxie"), *Stercorarius catarrhactes*.—At North Unst, usually appear about middle of April. "We do not see more than six or eight in a season."

PETREL, *Thalassidroma pelagica*.—Seen at North Unst in August, and at Dunnet Head on Oct. 10th, wind strong W., and haze, at 11 p.m.

TERN, *Sterna*.—Only one record. One struck at Pentland Skerries at 8.30 p.m. on Sept. 8th; wind strong S., and fog.

Terns always appear upon our Stirlingshire coast the end of August and beginning of September, remaining usually about a fortnight to three weeks.

The unusual scarcity of migrants is very generally reported upon at almost all the east coast stations. The remarks of the reporters, comparing the observations with former years, generally show this to be the case. Thus, commencing with our most northerly station, North Unst, I find it stated that, in most seasons, "Land birds, as Snow Buntings, Stonechats, and Starlings, strike the lantern." It is also stated that—"Until the last three years, large flocks of Iceland Gulls were seen during the month of April, going N.W. A few returned this

way." They are seen, however, every year in some numbers in October. At Sumburgh Head, Mr. Anderson says, "In twenty-one years I have not seen so few birds strike the lantern"; and Mr. Tulloch, writing from North Ronaldshay, says, "We have had so much of N.W. winds here this fall, that I think the birds have been kept more towards the south." Similar complaints of scarcity of migrants reach me from Auskerry, Hoy Sound (High), Holborn Head, Ness Head, and Isle of May; and an entire *absence* of all birds—"since the schedules came to hand"—is reported at several of these stations. The reason assigned by Mr. Tulloch is no doubt the correct one. From other stations local influences probably have more to do with the scarcity, as, for instance, the unfavourable positions of the lanterns. Thus, Cromarty is "situated on the point of the town of Cromarty, and almost among the houses." During seventeen years that the present principal light-keeper has been there, he does not think that more than a dozen birds have struck the glass. Altogether, few of our Scottish stations are situated in as favourable positions for observation as the lightships of the English coast. Perhaps the Bell Rock and Isle of May are the most favourable in the south, and the Pentland Skerries and some of the Orkney and Shetland stations in the north.

Besides the records under the various species which have been identified, there are many records of birds striking or passing, which were not identified. It is from a comparison of these and the other records that I arrive at the conclusion that the above stations are the most favoured. Thus, large numbers of birds struck the lantern of Bell Rock, and were lost between midnight and dawn on Oct. 7th, and again on the 14th, between 3 a.m. and dawn; on both occasions in foggy, hazy, or rainy weather, &c., as is almost invariably the case. I have not been able to trace from actual data, except in a few cases, the direction of the flight of the migrants, as such has not, as a rule, been noted by the reporters. It would be an advantage to have this done next season, under the column in the schedule for "General Observations." The species which have appeared in greatest numbers are Thrushes and Blackbirds, Larks, Wheatears, and Swallows; whilst Hooded Crows—noted as most numerous on the English east coast—are absent from all the Scottish returns, and Rooks occur only in one very far north instance, *viz.*, at North Unst.

The line of flight of the *Anatidae* is generally from N. to S., as explained further on by Mr. Cordeaux. I may mention here that this holds generally also on the west coast of Scotland, but that the lines of flight of the *Insecessores* are influenced by local causes, and configuration and trend of the west coast. Thus the direction, according to previous experience, is often from N.W. to S.E. When migrating over or near land the lines of flight follow the great valleys and then the coast-lines, often cutting off promontories, as at the Ross of Mull. These are probably birds having a starting-point more to the N.W.,—the Hebrides, Iceland, and North America,—and others which in their migrations from east to west overshoot the land and “hark back”; but we will speak more of this in our remarks under “West Coast.” Land birds have passed at all hours of the day and night, flying generally low, and in almost all kinds of weather. The *Anatidae*, as a rule, fly much higher, and consequently are only seen, or almost only, in clear weather.

Almost all records of birds caught or killed, or striking at the lanterns, are noted on dark or cloudy nights, with fog, haze or rain, or snow and sleet. The isolated stations, such as the Bell Rock, are most deadly; many are stunned and killed, and blown into the sea, at such localities. Birds on such nights often remain around the lights all night or rest on the window-sills of the tower and the balconies, or endeavour to obtain entrance to the tower. Whenever dawn appears they resume their flight towards the nearest land.

A great northward rush appears to have taken place at Bell Rock lighthouse between the 2nd and 11th of March, 1880, as noted in the duplicate schedule by Mr. James Jack, lately received by me. On the 2nd March great numbers of birds were seen flying about the lantern, apparently of various species, of which Blackbirds, Thrushes, and Mavises were recognised; wind S., light breeze, heavy sleet; sexes unidentified; a great number continued to strike hard on lantern all night from 10 p.m., and rebounding off, fell into the sea. On the 9th, great numbers, including Lapwings, Thrushes, Mavises, “Snowflecks,” Rooks and “Sea-piets,” from 5 a.m. till good daylight, when all disappeared in the fog; observer could not say in which direction they flew; wind S.E., light breeze, fog, and rain. This has been the largest migration seen this year; very large numbers of each species

seen. On the 11th March great numbers of Lapwings, Curlews, Blackbirds, and "Sea-piets," from 12 midnight till first streak of day, when all disappeared; cannot say in which direction; wind N.E., light breeze, and haze. A few struck lantern-lights and flew off again; sexes not made out. A perceptible increase in our birds at inland localities took place about this time, and notes on migration taken at various inland localities corroborate the rush at coast stations. Curlews were seen passing inland on March 6th for first time. Great Tits much increased in numbers, as also Chaffinches, Starlings, Thrushes, Blackbirds, &c.

EAST COAST OF ENGLAND.

Printed forms of enquiry and letters of instruction were sent to thirty-seven light-houses and light-vessels on the east coast of England. Twenty-five stations have sent in returns, and twelve have failed to do so. The stations from which co-operation was asked are as follows, commencing with the most northerly. Those from which returns have been received are marked with a *.

Berwick.

*Longstone, on the most easterly of the Farn Islands; white light, revolving every 30 seconds.

*Farn Islands (two lights); white, revolving every 30 seconds.

*Coquet Island, coast of Northumberland; two white lights in same tower. Souter Point.

*Teesmouth, No. 5 Buoy Lightvessel; one white light, fixed.

*Whitby, High Light; white, fixed.

Flamborough Head; two white, one red flash, revolving every half minute. Spurn Point.

*Spurn, Lightvessel, six miles S.S.E. of Spurn Point; white, revolving every minute.

Bull, Lightvessel, mouth of Humber.

*Outer Dowsing, Lightvessel, 53 miles E.S.E. Spurn; red light, revolving every 20 seconds.

*Inner Dowsing, Lightvessel, 17 miles E. Sutton, on Lincolnshire coast; green, 20 seconds.

Dudgeon, Lightvessel, 35 m. E. Skegness, Lincolnshire coast; white, fixed.

*Leman and Ower, Lightvessel, 48 miles E.N.E. of Cromer; two white lights, one fixed, one revolving.

*Hunstanton, Lighthouse; white, fixed.

*Cromer, Lighthouse; white, revolving every minute.

Hasborough, Lighthouse; white, fixed.
Winterton, Lighthouse; white, fixed.
*Newarp, Lightvessel, 12 miles N.E. Winterton; white, three quick flashes, and 36 seconds in a minute dark.
*Cockle, Lightvessel, 3 miles E. Yarmouth; white, revolving each minute.
*Lowestoft, Lighthouse; white, revolving 30 seconds, and red light, fixed.
*Corton, Lightvessel, 4 miles E. Lowestoft; red, revolving 20 seconds.
*Orfordness, Lighthouse; white, fixed.
*Shipwash, Lightvessel, 8 miles S.S.E. of Orfordness; white, fixed.
Languard Point, Lighthouse, entrance to Harwich River.
Cork, Lightvessel, 5 miles off mouth of Harwich River.
*Galloper, Lightvessel, 40 miles S.S.E. of Orfordness; two white, horizontal, fixed.
*Kentish Knock, Lightvessel, 33 miles N.E. of North Foreland; white, revolving each minute.
*Nore, Lightvessel, mouth of Thames; white, revolving 30 seconds.
*North Foreland, Lighthouse; white, fixed.
*Goodwin, Lightvessel, Goodwin Sands; white, revolving, three quick flashes in succession, 36 seconds darkness.
*Gull-stream, Lightvessel, Goodwin Sands; white, revolving 20 seconds.
*East-side, Lightvessel, Goodwin Sands, 13 miles E. of Deal; green, revolving 15 seconds.
*South-sand Head, Lightvessel, Goodwin Sands; white, fixed.
South Foreland, Lighthouse; white, fixed.
Dungeness Point; white, fixed.

Great credit is due to the observers of the various stations for the careful manner in which, as a rule, the returns have been made out. Taking them altogether the reports show truthful, accurate, and painstaking observation. Excluding the *Anatidæ*, Swans, Geese and Ducks, notes have been taken of about thirty-two different species.

SEPARATE REPORT OF EACH SPECIES OBSERVED.

Of *Raptoreæ* two only are mentioned, the Sparrowhawk and the Short-eared Owl. Of the former one visited the Inner Dowsing on Oct. 1st, at 3 p.m. At the Gull-stream on Sept. 19th one alighted on deck and was caught. At the South-sand Head on Sept. 23rd a very large Sparrowhawk stopped to rest on the rail, going W. At the same station on Oct. 2nd another settled on the lantern, also leaving for the west. These may have been hawks in passage, or pirates beating in the track of small migrants. The Short-eared

Owl occurs only at Teesmouth; on Sept. 29th one passed at day-break, one on Oct. 1st at 7 a.m., and another on the 16th at 3 p.m.

I saw the first Short-eared Owl on the Lincolnshire coast on Oct. 30th. Twelve were seen at Spurn the same morning. It thus appears that the migration of this species has extended just over a month, from Sept. 29th to Oct. 30th.

FLYCATCHER, *Muscicapa grisola*.—At the Galloper on Sept. 13th, from 10 p.m. to 4 a.m., hazy, 200 to 300 birds, mostly Flycatchers; twenty killed against glass of lantern. At the Kentish Knock on Sept. 18th two dozen Flycatchers through night around lantern, rain, going S.W. at daylight; none killed. At the Nore, Aug. 22nd, at sunrise, mixed with Larks, and again on Sept. 7th, same hour, without Larks. At the Gull-stream, on Sept. 17th, at 3.20 a.m., E., thick rain, large quantities of Flycatchers; lantern surrounded by birds. On Oct. 11th-12th, 11 p.m. to 5 a.m., N.N.E., rain, large numbers of Larks, Starlings and Flycatchers in vicinity of light; many struck and went overboard. Time of migration extending over fifty-two days.†

SONG THRUSH, REDWING, FIELDFARE, BLACKBIRD, and RING OUZEL.—With the exception of the last, which is reported from Heligoland, the *Turdidae* are noticed at fourteen stations extending over the whole coast-line. At the Longstone, on Sept. 11th, four Redwings killed at 3 a.m., gloomy and thick; on Oct. 30th and 31st Thrushes, Blackbirds and Redwings passed, wind E. and N. At the Farn Islands, Oct. 14th, Redwings, 9 a.m.; 15th, Thrushes and Blackbirds, N.N.E. half a gale; 22nd, several Blackbirds; 30th, same, and flocks of Redwings all day, E.; Nov. 20th, Fieldfares all day, E. strong; 22nd, same; Dec. 5th, 3 p.m., snow, Blackbirds and Thrushes. At Teesmouth on Dec. 1st, 10 a.m. to 1 p.m., snow, Redwings, Thrushes and Fieldfares, going from N. to S.W.; Dec. 2nd, a few Redwings. At Teesmouth lighthouse on Oct. 1st, at daylight, forty to fifty Thrushes, and twenty to thirty at 9 a.m. on the 7th; on Dec. 4th, at 6 a.m., one Blackbird struck the glass and was killed. At Spurn on Dec. 2nd, 9 a.m., large numbers of Thrushes. At the Outer Dowsing, Sept. 24th, four Blackbirds; on the 29th, 10 a.m. to 1 p.m., six Thrushes. At the Leman and Ower on Dec. 16th, Thrushes in company with Larks and Starlings all

† I find the following reference to this species in my note-book:—"Did not observe any Flycatchers, old or young, in this neighbourhood after the end of August: up to this time they were exceptionally numerous."—J. C.

through the night. At Cromer on Oct. 24th three Thrushes struck the lantern during the night; on the 30th four, and on Nov. 16th five others. At the Newarp, Nov. 28th, 9 a.m., six Blackbirds passed. At the Kentish Knock, Nov. 18th, one Thrush killed. At the Nore, Nov. 7th, four Blackbirds, going W.S.W.; Nov. 3rd, Fieldfares. At the North Foreland, Nov. 21st, 1 a.m., E.S.E., snow, one Blackbird killed. At the Gull-stream, Nov. 21st, cloudy and showers of snow, Starlings, Blackbirds, and Thrushes in the vicinity of light from 1 to 4 a.m.; six Starlings, four Thrushes, and one Blackbird killed. At the South-sand Head, Oct. 12th, dense fog, many Thrushes; several killed. General line of migration, with few exceptions, E. to W., carried on both by day and night; a considerable proportion, however, appear to arrive from daybreak to 10 a.m. Migration of Thrush extending over seventy-seven days, from Oct. 1st at Teesmouth to Dec. 16th at the Leman and Ower; of Redwing, sixty-five days, from Sept. 11th at the Longstone to Dec. 2nd at Teesmouth; of Fieldfare, twenty-eight days, from Nov. 3rd at the Nore to Dec. 1st at Teesmouth; † of Blackbird, seventy-two days, from Sept. 24th at the Outer Dowsing to Dec. 5th at Farn Islands. ‡ On Oct. 29th, S.E. and E., *Turdus iliacus* crossed Heligoland in large numbers, "thousands and thousands passing on overhead; the same day, *T. torquatus*, "a few"; *T. merula* and *T. musicus*, "limited numbers"; "*T. iliacus* descending from invisible heights down to about one hundred feet above island,—three hundred feet above the sea,—then all of them passing on; when atmosphere got clear again, in afternoon, passage ceased." Again on the night of the 30th, N.N.E., "enormous number of *Turdidae* passing overhead."

REDBREAST, WHITETHROAT, WREN.—The same notes in the reports applying generally to the three species, it is not necessary to treat them separately. At Coquet Island, on Sept. 13th, 11 p.m., two Redbreasts struck glass, not killed. At Hunstanton, on

† Mr. W. Eagle Clarke reports that on the 24th of January last large numbers of Fieldfares were seen between Easington and Kilnsea, near Spurn Point, and as they were the first seen in the neighbourhood this season they were no doubt immigrants, more particularly as the locality in which they were seen is one where they are only observed during or immediately after arrival. Large flocks appeared also in North-East Lincolnshire during the last fortnight in January, so far as my own observations go, composed entirely of old birds. Mr. Gätke also writes, "All January through, night from 10th to 11th, great many from the east; 21st to 24th, the same."—J. C.

‡ Numbers of fine old cock Blackbirds arrived at Spurn during the latter part of January, and early in February at the same time with the Fieldfares.—J. C.

Oct. 13th, 1 p.m., fog, a Wren and Redbreast seen. At Cromer, May 23rd, 1 a.m., a great many Wrens; two killed, also one Redbreast; May 27th, 11 p.m., Wrens and Whitethroats, five killed (these last notes are referable to the spring migration); Sept. 12th, Wrens and three Redbreasts strike glass. At Spurn this autumn the Common Wren did not appear before the middle of December; they usually arrive about the end of October.† Redbreasts were very numerous at Spurn on Oct. 30th, wind blowing very fresh from N.E. None reported from Heligoland, but a great many *Accentor modularis* on Oct. 29th, wind S.E. and E.

GOLDEN-CRESTED WREN.—Most exceptionally scarce; only one mentioned, at the Cockle, on Oct. 16th, at 3 p.m., wind N.N.E., when one came on board and was caught. Three were seen in a garden near Spurn on Oct. 27th and 28th; none, so far as I am aware, on any part of the Lincolnshire and Durham coasts, neither are they mentioned in the Heligoland report.

TITMICE.—At the Gull-stream, Sept. 17th, 3.20 a.m., thick, rain, E., several Titmice seen round lantern amongst the Flycatchers. Mr. Gätke remarks, "There have been no *Parus major* all this autumn, and we have actually seen only one bird"; early in October, "daily some *Parus ater*, that come here rarely but when there is an appearance of easterly winds."

WHEATEAR.—At Hunstanton, May 24th, 11 p.m. to 2 a.m., drizzly rain, forty-one small birds killed, amongst them three Wheatears. At Cromer, Aug. 16th, 1 a.m., several Wheatears; four killed.

TITLARK, *Anthus sp.?*—At Spurn, May 25th, 1 a.m., rain, several Titlarks killed (referable to the spring migration). At the South-sand Head, Oct. 12th, 3 a.m., N.E., dense fog, Titlarks, amongst thousands of other birds, around and passing lantern.

SHORE LARK, *Otocorys alpestris*.—On Dec. 19th two were shot from a small flock on the Humber side of Spurn Point; these were received in the flesh on the 22nd by Mr. W. Eagle Clarke, of Leeds.‡ At Heligoland, on Oct. 1st, "some flights"; 5th, "some score"; 8th, "a great many"; 10th, "many flights"; on the 24th likewise, and again on the 29th, "many."

† A friend, the owner of several steam-tugs, informs me that he has frequently known the Common Wren to come on board his vessels when far from land on the North Sea.—J. C.

‡ Mr. Clarke subsequently informed me that on March 18th, this year, he saw a flock of about twenty Shore Larks at Spurn, and that during the past winter thirty-three have been shot there, in the proportion of two males to one female.—J. C.

SKY LARK, *Alauda arvensis*. — None reported north of the Humber, and a negative return from Heligoland. South of the Humber, from every station making returns, and showing a gradual increase towards the more southern stations, where they crossed in immense numbers. Earliest date of passage, July 24th, at the Goodwin, 10 a.m., ninety to a hundred flying N.W. to the nearest land, and again at the same station on Aug. 4th. After this no further notice till Sept. 17th, when the regular and normal migration of this species appears to have set in and continued without intermission till Dec. 27th. Leaving out the two earliest dates as exceptional, we shall find that the immigration of the Larks to our east coast was continued over 102 days. During October, November and December (first fortnight) they crossed continually, passing from E. to W., also from points S. of E. to others N. of W., over the narrowest part of the North Sea, as is shown in the returns of the most southern lightships—Galloper, Kentish Knock, Nore, North Foreland, Goodwin, Gull-stream, East Side, and South-sand Head; time, any hour of the day or night; direction of wind, variable. It would be quite impossible in a limited space to give anything like a detailed statement of the immigration of Larks, so a few extracts from my summary of the reports must suffice. There was a "great rush" of Larks and other species between Oct. 12th and 23rd. On the 16th October more birds appear to have crossed than on any day during the autumn. There was again a "final rush" of the laggards just preceding and during the outbreak of severe weather early in December. At the Newarp, Sept. 29th to Oct. 27th, on fourteen days, going W., no particular hour, some striking lantern at night. At the Cockle, Sept. 28th to Oct. 17th, as a rule, very early in the morning (4.30 to 9.20 a.m.), on foggy, thick nights stopping to hover round lantern, some strike and are killed; Oct. 9th to 16th, "great rush." At the Corton, Oct. 22nd and 23rd, flocks passing all day to N.W.; Nov. 11th, many hundreds during day; and again on Dec. 25th, all day from N.E. to S.W., Ducks and Larks; Dec. 27th, hundreds of Larks during afternoon. At the Shipwash, from Oct. 9th to 16th; all day on 15th and 16th. At the Galloper,† from Oct. 8th to 24th, Larks, Starlings and Chaffinches, generally

† Birds passing this station were all passing to E. or E.S.E. or S.E. in October. On Nov. 24th great numbers of Larks and Starlings were observed passing to N.N.E. See general remarks at end of report.—J. C.

during night; between these dates 135 of these species killed against lantern. At the Kentish Knock, Oct. 23rd, N.W., hazy, Larks and Chaffinches through night, "in clouds," sixty picked up on deck, and probably double this number falling overboard; Dec. 1st, from noon to 2.30 p.m., thick snow falling, Larks, Curlews, Starlings, Ducks, Chaffinches and Linnets, too numerous to mention; they came in clouds from N.E. to W.S.W. At the Nore, Aug. 4th to Dec. 6th and 7th, on forty-four days; on Dec. 6th and 7th, by hundreds all day, often mixed with Starlings, Linnets and Sparrows. At the North Foreland, on Sept. 17th, a few; Oct. 16th, midnight, misty, fourteen Larks and ten Starlings; 17th, between 3 and 4 a.m., ten Larks and nine Starlings struck. At the Goodwin, Sept. 17th to Dec. 7th, on nineteen days, going W. or N.W. or W.N.W.; Oct. 13th and 15th, in shoals throughout night; 13th to 22nd, "great rush." At the Gull-stream, Oct. 16th to 22nd, "great rush," flocks two hundred yards apart, passing westward. At the East-side, Oct. 9th to Dec. 12th, on seven days, E. to W.; on Sept. 23rd, going N. to S., with a N.E. wind blowing. At the Southsand Head, Oct. 12th, 3 a.m., dense fog, "great rush," thousands of Larks and other birds, many killed; Dec. 1st, 3 p.m., dense fog and snow, "final rush," Larks, Starlings, and fifty Curlews; twelve Starlings caught on board, but no Larks. Mr. J. H. Gurney, jun., writing from Lowestoft, says, "On Wednesday (Oct. 22nd), the arrival of Larks here was regular throughout the day." On Oct. 29th, at Spurn Point, Mr. W. Eagle Clarke, of Leeds, says, "Sky Larks arriving and passing south in thousands the whole day." Immense numbers also arrived on the Lincolnshire coast in the last fortnight of October. (At Heligoland, Oct. 29th, S.E., and E., "*Alauda arboreus*, many.")

SNOW BUNTING, *Plectrophanes nivalis*.—None at stations south of the Humber. At the Longstone, Sept. 5th, 8.30 a.m., wind S., one was seen on the rocks; my correspondent remarks, "Earliest date I have ever seen a Snow Bunting on these islands (Farn Isles)." At the Farn Islands, Oct. 3rd, 11.30 a.m., three Snow Buntings flying N.W.; Oct. 25th, afternoon, in flocks flying W. At Teesmouth, Nov. 7th to Dec. 20th, several flocks between these dates flying N.W. At Spurn, Snow Buntings were first seen on the 28th October; and large flocks of from 400 to 500 in the Lincolnshire marshes during the first week in November. At Heligoland on Oct. 30th, N.N.E., "*Emberiza nivalis*, a great many," and on

the 31st, S.E., calm, overcast, "Snow Buntings and Finches." Leaving out the Farn Island date as exceptional,† we find the regular migration of this species to have commenced on Oct. 25th and finished Dec. 20th—fifty-seven days.

CHAFFINCH, *Fringilla cælebs*.—Has occurred at several stations, and both north and south of the Humber. At the Longstone, Sept. 28th and Oct. 1st, 6 a.m. till noon, S. strong, rain and mist, flocks of Finches and other birds going W. At the Outer Dowsing, Oct. 13th, at noon, going E. to W.; Oct. 24th, 7 p.m., overcast, rain, thirty round lantern, two killed. At the Leman and Owers, Oct. 7th, N.N.E., gloomy, mixed flocks of Larks, Chaffinches and Starlings during day and night. At the Newarp, Sept. 26th to Oct. 23rd, on several days. At the Cockle, odd birds, on three days, strike lantern or come on board. At the Kentish Knock, Oct. 23rd and Dec. 1st (see Sky Lark). At the Goodwin, Sept. 17th, 9 to 11 p.m., overcast, hazy, flying round lantern. Migration extending from Sept. 17th to Dec. 1st—seventy-six days.

LINNET, *Linota cannabina*.—None registered north of the Shipwash, off the Essex coast, where from Oct. 9th to 16th flocks passed daily, all hours, going E. to W. At the Nore, Oct. 14th to Nov. 12th, invariably mixed with Larks. At the Gull-stream, Oct. 15th to 22nd, many flocks.

TWITE, *Linota flavirostris*.—One station only, the Kentish Knock, Oct. 24th, misty with rain, "Mountain Linnets," Larks and Starlings through the night; sixty picked up on deck, as many more went overboard. Nov. 8th, one caught on deck.

TREE SPARROW, *Passer montanus*.—Flocks of Sparrows‡ were noticed at several stations south of the Humber. At the Outer Dowsing, on Sept. 29th, at noon, and Oct. 13th, 2 p.m., travelling from E. to W. At the Kentish Knock, Oct. 22nd to Nov. 8th, going from S.E. to N.W.; on Nov. 8th two came on board. At the Nore, Oct. 27th and Nov. 15th, on latter day mixed with Larks. At the Goodwin, Oct. 6th and 22nd, passing to W.N.W. At

† In a note to Yarrell's 'British Birds' (vol. ii., p. 6, 4th ed.), Prof. Newton cites, on my authority, the occurrence of a Snow Bunting on the Lincolnshire coast on Sept. 16th, 1875, as perhaps the earliest date for England. The Farn Island bird must now take precedence by eleven days.—*J. C.*

‡ It is not improbable that in some of the returns the entries may refer to the Common Sparrow. We know, however, that *Passer montanus* is such a constant and regular migrant to our east coast in the autumn that in the majority of cases it will refer to this species.—*J. C.*

the Gull-stream, Oct 16th, large numbers of Sparrows and Linnets going W.; also on the 24th, 3.30 p.m., flocks 200 yards apart. At the East-side, Nov. 8th, 9 a.m., a flock going E. to W. At the South-sand Head, Oct. 8th, "French Sparrows"; 16th, the same, some settled on board. Time of migration Sept. 29th to Nov. 15th —forty-eight days. During September and October Tree Sparrows usually arrive in North-East Lincolnshire in flocks containing many hundreds. This year has been quite an exceptional one, and only a few stragglers have been seen. I suspect the persistence of north-westerly winds in the autumn has driven these and the great body of our immigrants much further southward than is usual. The returns indeed show this to be the case.

HOUSE SPARROW, *Passer domesticus*—Only once mentioned, at the Corton, Sept. 28th, 7.50 a.m., large flock going west, males and females. As the female of the preceding is undistinguishable from the male, this entry undoubtedly refers to the Common Sparrow. We know that the House Sparrow is a migrant across Heligoland,† and my own observations on the Lincolnshire coast tend to the same conclusion.

STARLING, *Sturnus vulgaris*.—Next to the Lark, the Starling occupies the most prominent position in the reports. It is noticed both north and south of the Humber at seventeen stations:—the Longstone, Coquet Island, Teesmouth, Outer Dowsing, Inner Dowsing, Leman and Ower, Cromer, Newarp, Cockle, Galloper, Kentish Knock, Nore, North Foreland, Goodwin, Gull-stream, East-side, and South-sand Head. Enormous numbers passed the southern stations in October, November and December. Sometimes in separate flocks, sometimes mixed with other birds. They crossed at all hours of the day and night, and in all winds and weather. Earliest recorded, Cromer, June 10th, 2 a.m., "quantity"; the Newarp, 7 a.m., on July 4th, going E. to W.; these were young birds.‡ Leaving out the earliest dates as referring to the migration of the young, we find that the regular immigration on to our east coast commenced on Sept. 22nd, when four were killed against the lantern of the Longstone at 3 a.m., to Dec. 16th

† See a letter by Mr. Gätke in 'The Times,' March 31st, 1877, on the "Migration of Sparrows."

‡ This bears out Mr. Gätke's observation in a letter dated Heligoland, 1879, when he says, "Hundreds of thousands of young Starlings from end of June to end of July. Hundreds of thousands of old birds during October, November, and later; young and old strictly divided in their migrations."

at the Leman and Ower—eighty-six days; migration E. to W. The Starling, like the Lark, appears to have a particular facility for immolating itself against the lanterns. At the Leman and Ower large numbers of Starlings, along with Larks and Chaffinches, were taken in October; at the Galloper (see Sky Lark); also at the North Foreland, and many other instances too numerous to mention. At Heligoland this year there have been no young Starlings during July; Mr. Gätke says he may perhaps have seen a hundred, and this is all.

HOODED CROW, *Corvus cornix*; ROOK, *C. frugilegus*; DAW, *C. monedula*.—The migration of Rooks is not noted on the English coast north of the Humber; south of this they were noticed at nearly every station as either Rooks or "Black Crows," to distinguish them from the Hoodie or Grey Crow. Immense numbers of both Rooks and Grey Crows crossed on Oct. 16th from daylight to dark, travelling from E. to W. Noticeably at the Inner Dowsing, on Oct. 16th, large number of Crows, from N.E. to W.; at Hunstanton, on the 17th, Hooded Crows and Rooks all day; at the Newarp, on the 16th; at the Cockle, the same day, "height of rush," Crows and Rooks, 9 a.m. to 6 p.m., going W., and again on the 22nd, 23rd and 24th, large numbers of Crows, Rooks, Starlings and Larks, from daylight to dark, passing W.; again on Nov. 8th, large flocks of Crows. At the Corton, on Oct. 16th and 22nd, continuous flocks of Crows, Daws and Larks all day, E. to W., also Nov. 8th and 11th and Dec. 27th. At the Shipwash, Oct. 15th and 16th, constant on 15th, till 12 a.m.; on 16th, 9 a.m. to 3.20 p.m., from S.S.E. to N.N.W. At the Goodwin, Oct. 15th to 21st, Crows "in shoals." At the South-sand Head, Oct. 16th, Rooks, 9.30 a.m., going W.N.W. and N.W.; and seven other stations. In the returns it is impossible in many cases, under the general entry of "Crows," to separate the Hooded Crow from the Rook. It appears, however, that immense numbers of the *Corvidæ* crossed the North Sea; Rooks at stations south of the Humber, and Hooded Crows at both northern and southern stations from Oct. 15th to Nov. 19th. Both Rooks and Hooded Crows appear to have started simultaneously on Oct. 15th, and passed across the North Sea from E. to W. in almost continuous flocks on the 16th and 17th; and after these dates in more scattered detachments, less and less to Nov. 19th. And again during the latter part of December; the last entry is on Dec. 27th at the Corton,

Crows passing E. and W. in afternoon and Larks in hundreds. Daws are only mentioned at two stations; the Corton on Oct. 16th and 22nd, continuous flocks of Daws and Crows all day; also at the Shipwash on the 16th. At the Inner Dowsing on Oct. 22nd four Crows remained all night on globe above the lantern, and five took up their position in the same quarter on the night of Nov. 8th, leaving at daylight for the Lincolnshire coast. The wind on the North Sea on Oct. 16th was N. to N.E., force 4 to 7.

CUCKOO, *Cuculus canorus*.—On Sept. 17th, 10 p.m., at the North Foreland, wind E., overcast, misty, a Cuckoo struck the south side of the lantern, but was not killed.

SWALLOW, *Hirundo rustica*.—The spring migration was noticed at two stations—the Cockle, June 8th, 9.20 a.m., five Swallows passed towards land; also on July 1st at 4.30 a.m., ten passing to W.S.W.; at the South-sand Head, July 6th, twenty at 3.30 a.m., flying towards N.N W. The autumn migration was observed at several stations both north and south of the Humber. At Coquet Island, Aug. 15th, midnight, S.E., three Swallows struck glass of lantern, but were not killed; on the 20th great numbers were seen flying about, two striking glass after dark, but were not killed. At Whitby, on Oct. 4th, 9.30 a.m., flock going south. At Hunstanton, on Sept. 16th, 2 p.m., a flock alighted on lantern and gallery; and on Oct. 12th, 3 p.m., fog, twelve came up to light and dispersed in various directions. At the North Foreland, on Sept. 9th, 10th and 11th, about forty passed each day; and on the 21st, about one hundred flew round the lantern top for an hour. At the South-sand Head on Sept. 28th, twelve Swallows passed. Migration extending from Aug. 15th to Oct. 12th—fifty-nine days.

SWIFT, *Cypselus apus*.—The autumn migration of Swifts, so remarkable in 1879 for the great numbers seen at various places on the north-east coast (see Zool. Jan. 1880, p. 8), was observed at only two stations. At Teesmouth, great numbers flying about during the last three days of August. At the Nore, on Aug. 1st and 2nd, between 6 and 7 a.m., and again on the 20th; last on Oct. 10th, 9 a.m., Swifts mixed with Larks. At Heligoland, Martins and Swifts, "rather great numbers during August; particularly noted on the 16th, wind S.E., Swifts a great many; on the 20th, the same."

CHARADRIIDÆ.—The burst of severe weather during the early days in December brought an immense influx of Plovers to our

east coast from the north; large flocks are noticed at this time at the more northern stations, more particularly at Coquet Island on Nov. 26th and Dec. 6th, northerly and westerly winds, force from 6 to 8. There is only one notice south of the Humber, and this early in the season. At the Shipwash, Oct. 12th, flock of thirty Lapwings, going westward.

Woodcock, *Scolopax rusticola*.—Was observed at the Farn Islands, Oct. 22nd, 30th (great flight), Nov. 1st, Dec. 2nd, N.E. to N.N.E. At Coquet Island, Sept. 29th, S.W., strong, one; and Oct. 24th, also one; about noon on both days. At Teesmouth, Nov. 2nd, three at daylight. At the Outer Dowsing, a station more than fifty miles from the nearest land, on Dec. 12th, two flying W. At Heligoland, Oct. 30th, N.N.W., early at dawn, great many Woodcocks; about 100 killed. Great numbers were shot on the Yorkshire and Lincolnshire coast on the morning of Oct. 31st, sixty at Spurn Point alone; wind very fresh from N.E. on the previous night with drizzly rain. The migration of Woodcocks extended from Sept. 29th at Coquet Island to Dec. 12th at the Outer Dowsing—seventy-five days. The “great flight,” at Heligoland on the morning of Oct. 30th; east coast of England, on the night of the 30th.

SNIPE, *Gallinago media*.—At the Longstone, Sept. 17th, 2.30 a.m., misty, one struck the lantern and was killed. At the Farn Islands, on Dec. 2nd, 10th and 19th. At the North Foreland, on Nov. 14th, 1.30 a.m., N., moderate gale, and again on the 21st, at 5 a.m., snow, Snipe were killed. Very large numbers arrived in Holderness and North Lincolnshire, from the middle to the end of November, just preceding the outbreak of severe weather in December. They left the district again, almost to a bird, before the middle of the month.

CURLEW, *Numenius arquatus*.—Curlews were in large flocks at Teesmouth on Sept. 27th. At the Inner Dowsing, Sept. 1st, three going from N.E. to S.W. At Hunstanton, on Oct. 13th, 4 a.m., fog, one struck glass of lantern and was taken. At the South-sand Head, Aug. 13th to 29th, large flocks, 100 to 200 in a flock, going S. and S.W. The Curlew migrates early in the autumn, Aug. 13th to Sept. 29th. Most of these entries will probably refer to young birds, the old Curlews coming later in October and November. At Heligoland, Oct. 30th, many passed over.

ANATIDÆ.—Between Dec. 4th and 20th Swans passed the

Teesmouth from N. to S. in some numbers; on the 4th, six; the 8th, five (four old and one young); 14th, nine (eight old and one young); 15th, forty-three; 16th, three; 18th, two; the 20th, ten at 10 a.m., and ninety-five at 11 a.m. On the 18th a flock of thirty was seen near Spurn, one old white bird acting as pilot, the remainder all young, in the brown plumage. Two Bewick's Swans were shot on the Humber on the 8th. Four passed the Kentish Knock, on Dec. 4th, 2.15 p.m., N.E. to S.W. Two Swans, which may have been "escaped birds" from some private waters, passed the Teesmouth on Sept. 30th, 10 a.m., flying S.E. Geese were observed at several stations both north and south of the Humber, going south from Aug. 18th to Dec. 13th, the main body passing south during the last half of November and in December. Brent or "Black Geese" are noted at the Corton, going south, July 18th, twelve; July 30th, two flocks of from thirty to forty; on Sept. 17th, thirty. These are very early dates for Brent Geese.† Mr. Cotton, the observer, might have possibly been led into an error by passing flocks of black Scoters. As, however, "black ducks" are frequently mentioned in his return, this could hardly be the case, and he appears very well able to discriminate between the two. At the Corton, Dec. 4th, hundreds of black geese from N.E. to S.W. from sunrise to noon—i. e., towards the mouth of the Thames or Essex coast. As might have been expected, large flocks of Ducks are constantly noted, so frequently, indeed, as to defy repetition; this is more particularly the case in the returns from the lightships. They are noted sometimes flying S., from the land or to the land, and in fact in every direction. Many of these would be local flocks going to and from their feeding grounds. Immense numbers, however, coming from the north, passed along the coast in November and December. At Coquet Island, on Dec. 14th, 3 a.m., N.W., blowing a gale, two Eider Ducks (spelt phonetically, "Ida" in the report) struck lantern and one was killed.

RED-THROATED DIVER, *Colymbus septentrionalis*.—Red-throated Divers and Mergansers are mentioned in the report from Teesmouth during November. With regard to the first of these, Mr. Gätke sends the following curious note, dated Dec. 22nd, 1879:—"Colymbus septentrionalis, almost by the million. During

† Major C. Russell, writing from Essex, says, "The earliest occurrence of Brent Geese on our coast I ever remember hearing of was Sept. 29th, when many years ago one of our coast gunners, still living, killed ten at a shot."

the last forty years there have never, during a single autumn, been a fiftieth part of what we see here now every day—all passing along, principally during the forenoon, east of the island in an E. by N. direction, which I think they continue till coming to the Holstein coast, then strike off in a northerly course up to the extreme north of Jutland, and from thence cross over to the Dutch coast, perhaps next morning to renew the trip. There are constantly so many that one scarcely can believe them always to be fresh birds."

PROCELLARIDÆ.—At the Longstone, on Sept. 18th, at 3 a.m., two Petrels were caught against the lantern-windows. At Coquet Island, on Nov. 4th, 3 a.m., one killed against the lantern. At the Goodwin, Oct. 11th, five were seen with many Larks and Starlings round the lantern at night. Greater numbers of *Procellaria glacialis* have been seen off Heligoland during the autumn than has been the case for the last twenty years.

Independent of the notes of each species, as already given, numerous flocks of small birds were seen passing the stations, but too far distant to determine the species. This was specially the case at the Spurn, on Dec. 3rd and 8th; at the Cockle, on Oct. 9th; and at the South-sand Head, on Sept. 20th. At the Kentish Knock, on Nov. 20th, half-a-dozen small birds came on board at midnight, which, from the written description in the margin, were probably Greenfinches. It is, however, impossible to give even a guess at another species which visited another lightvessel on Sept. 20th, "Fifty very small birds—in fact, the smallest of British birds—like a Sky Lark, but a deal smaller." From the date, they may have been either Titlarks or Flycatchers.

No rare migrants have been noticed, but this was scarcely to be expected. In this respect the budget of notes supplied by that veteran ornithologist Herr Gütke bears a striking contrast to our east coast reports. On that small island, so favourably situated for observation, Mr. Gütke has trained up quite a host of practical observers, and any rare visitant will have to be very sharp if it succeeds in escaping detection. Quoting from Mr. Gütke's letter dated Dec. 22nd, we have, on Sept. 17th, *Sylvia fuscata*, though not got; *Anthus Richardi* on the 18th; *A. cervinus* on the 20th; *Picus leuconotus* on the 21st; then some days S.W. with rain and no birds; 26th, calm and clear, *Emberiza pusilla*; 27th, E.N.E.,

Anthus Richardi, *Emberiza pusilla* (two shot), *E. aureola* (seen); 28th, *E. pusilla* (two seen), *E. rustica* (one shot); 29th, *Sylvia superciliaris* (one); 30th, *Emberiza pusilla* (one); Oct. 1st, *E. pusilla* (one); Nov. 2nd, 3rd and 4th, westerly winds and nothing, but daily some *Parus ater*; on the 5th, again, *Anthus cervinus* (seen and heard); northerly winds, sometimes N.E. on the 8th, a Leaf Warbler seen at close quarters, but not procured by Aeuckens, the Heligoland birdstuffer, which Mr. Gätke feels tolerably certain was a very rare visitant; the same day there were two or three *E. rustica*, and one each of *A. pusilla* and *A. cervinus*. The rare Leaf Warbler was again seen on the 9th, but could not be obtained; an *Emberiza rustica* was also seen. On the 10th, *E. pusilla* shot and *E. rustica* seen. On the 12th, *Muscicapa parva* and *Motacilla lugubris*, which latter comes there rarely in autumn. On the 14th, *Sylvia superciliaris* was shot by Mr. Gätke's eldest son, and two more were seen by Aeuckens in a garden where shooting was not permitted. On the 18th, one very fine *E. pusilla* shot. On the 20th *Lestris affinis* was seen close by, but not shot, as it would have fallen in the sea and drifted away. This is the third, if not the fourth, known occurrence of the Siberian Herring Gull at Heligoland. On the 24th a large Redpoll was shot, which Mr. Gätke thinks can only be the Greenland bird, *Linota Hornemannii*.

A summary of the various returns show that four species, Larks, Starlings, Rooks and Hooded Crows, in the order given respectively, far outnumber any other, and of these four the Lark far exceeds the rest in migratory numbers. As a rule, the lines of migration followed have been from E. to W., or S.E. to N.W. direct on to the English coast. To the middle of October we find birds rarely coming from points north of east; after this date they appear to come occasionally from directions north of east, between east and due north. The line of migration of the *Anatidæ* has been from north to south, crossing the line of the *Insessores* at right angles.

There is one remarkable exception to the general rule of an east to west route in the case of the lightvessel on the Galloper Bank, forty miles S.S.E. of Orfordness. All entries in this return show birds passing to the E. or S.S.E. or S.E. during October. We can only account for this anomalous line by supposing the birds which cross the Galloper have previously struck the English coast at some higher latitude, and after skirting the coast line

shot off again somewhere near Orfordness and crossed the North Sea to the Belgian and French coasts between Nieuport and Dunkerque. On Nov. 24th a great quantity of Larks and Starlings passed the Galloper towards the N.E., a line which if persevered in would eventually bring them to the Dutch coast.

At the East-side from the 2nd to the 5th of November flocks of "Crows" were observed passing from the S. to the N., or from the French to the Suffolk coast. The great body of the immigrants during 1879 have crossed at the more southern stations, the four lightships on the Goodwin Sands, also the Nore, the Shipwash and Kentish Knock showing a constant and continuous stream on to the south-east coast. These birds would all cross at the narrowest part of the North Sea directly from E. to W. to the English coast. The long prevalence of north-westerly winds in October and November may to a great extent have deflected the lines of migration much farther to the south than is generally the case.

Migrants have passed the stations at all hours of the day and night, flying at no great altitude and in almost all winds and weather. When the nights are dark and cloudy, no stars appearing, in rain, fogs and snowstorms, flocks of birds during the night migrations will crowd round the lanterns of the lightships; many strike the glass and are killed, falling on deck or pitching overboard. On these nights birds will often remain for hours in the vicinity of a light, circling round and round, evidently having lost their way; at the first break in the clouds, the stars becoming visible, or the first streak of early dawn, they will resume their flight to the nearest land.

The "great rush" of immigrants was from the 12th to the 23rd of October. The "final rush" took place just preceding and during the first burst of winter, early in December.

The occurrences when birds travel dead to windward are very rare indeed, and then only with light winds. In the great majority of cases birds migrate flying within two to four points of the wind, sometimes with a "beam" wind, or even a point or two "abaft of beam." If the wind changes during the actual passage, birds will change the direction of their flight to suit the wind. Thus at the Shipwash, on Oct. 16th, from 9.50 a.m. to 1.20 p.m. the wind was N.N.W., flocks constantly passing from S.E. to N.W. from 1.20 to 3.20 p.m. the wind blew from N.N.E., and the birds passed

S.S.E. to N.N.W. If subsequent observations should prove the correctness of this rule, it will go far to account for all the irregularities of migration—the “why” birds are seen in great numbers in one year in any locality, and perhaps absent altogether in following seasons.

Subsequent to the writing of this report I have received several communications showing a large and very remarkable influx of immigrants on to the east coast of England in January and the first fortnight in February, 1880. On Jan. 24th great numbers of Fieldfares were seen near Spurn Point, between Easington and Kilnsea, and since this date they are reported as very numerous in the locality; with the Fieldfares came many fine old cock Blackbirds. In North-East Lincolnshire, also, during the last fortnight in January I saw many very large flocks of Fieldfares, apparently entirely composed of old birds; before this time scarcely any had been seen. Mr. Gätke writes from Heligoland:—“*T. pilaris* all January, through night from 10th to 11th, great many; also Oystercatchers and other waders coming from the E; also from 21st to 24th, the same.” These dates agree very well with the time of their arrival on our east coast. Short-eared Owls arrived in some numbers at Spurn in the last week in January. A very large flock of Snow Buntings was seen on the 8th February. On the Lincolnshire side I noticed an immense flock of the same species, fresh arrivals, on the 5th; and on the 11th thousands, also hundreds of Larks. This final and third “rush” of immigrants so late in the winter is curious, and may perhaps be explained by the comparatively milder winter over Northern Europe, compared with what we have experienced in the central and southern zones of Europe. We have indeed a recent precedent for this in the winter of 1877-78, when, after a long continuance of mild weather in Scandinavia, a sharp and sudden outburst of real winter drove the Fieldfares, as Mr. Gätke says, over Heligoland, on the night from the 27th to 28th January, in “countless flights.”

WEST COAST OF SCOTLAND.

PRINTED forms of enquiry and letters of instruction were forwarded to thirty-eight lighthouses on the west coast of Scotland and the Isles. Twenty-four stations have sent in returns, and fourteen have either sent none, or have returned blank forms, owing to the scarcity of birds. The stations from which co-operation was asked are as follows, commencing with the most northerly, and those from which returns have been received are marked with a * :—

- *Cape Wrath, Sutherland ; white and red alt., rev. every minute. J. M'Gill.
- *Rhu Stoer, W. Cromarty ; white, interval 1 minute. William Wither.
- *Butt of Lewis, Lewis ; white, fixed. George Edgar.
- Stornoway, Lewis ; 2 lights, white, rev. $\frac{1}{2}$ m., & white, fixed. R. Murray.
- *Island Glass, Harris ; white, fixed. William Innes.
- Ushenish, North Uist ; red, fixed.
- *Monach Island ; same tower, upp. white fl., low. red, fixed. J. Youngclause.
- Barra Head, Barra ; white, interval $2\frac{1}{2}$ minutes.
- Rona, Skye ; white fl., every 12 seconds. David Dunnett.
- Kyleakin, Rossshire ; white and red, fixed. David M'Culloch.
- *Isle Ornsay, Skye ; white, fixed. David Ross.
- *Ardnamurchan Point, Argyleshire ; white, fixed. David Laidlaw.
- { Hynish, Skerryvore Signal Tower, Tyree ; no lights. † William Crow.
- *{ Skerryvore, off Tyree ; white, revolving every minute. „
- *Dhuheartach, S.W. of Ross of Mull ; white, with red sector, fixed. J. Ewing.
- *Sound of Mull, Tobermory ; red, green, & white sectors, fixed. W. M'Lellan.
- Corran Ferry, Loch Eil ; red and white sectors, fixed. Thomas Tulloch.
- Lismore Island, Oban ; white, fixed.
- *Fladda, Easdale ; white, with a red sector, fixed. James Langton.
- *Rhuvaal, Islay ; white, with red sector, fixed. David Spiuk.
- *M'Arthur's Head, Islay ; white and red sectors, fixed. Thos. Sutherland.
- *Skervuile, Jura ; white, revolving every $\frac{1}{2}$ minute. John Ewing.
- *Rhinnis of Islay, Islay ; white fl. every 5 seconds. Andrew Lyall.
- *Lochindaol, Islay ; white and red sectors, fixed. William Mail.
- Mull of Kintyre ; white, fixed. James Thompson.
- Sanda, Kintyre Sound ; red, fixed.
- *Devaar, Kintyre ; white, revolving every $\frac{1}{2}$ minute. Charles Black.
- *Pladda, Arran ; 2 lights 8 yards apart, white, fixed. Thomas Grierson.
- *Lamlash, Arran ; green, fixed. David Waters.

† This station included by mistake, but retained for convenience, bracketed with the next.

Turnberry, Ayrshire; white fl. every 12 seconds. Charles Black.
 *Corsewall, Wigtown; white and red alternate every minute. R. Laidlaw.
 *Loch Ryan, Wigtown; white, fixed. Ralph Ewing.
 *Portpatrick, Wigtown; white, fixed. James Beggs.
 *Mull of Galloway, Wigtown; white, intervals. M. Morrison.
 *Little Ross, Kirkeudbright; white fl., every 5 seconds. W. A. Mackay.
 Point of Ayre, Isle of Man; white and red alternate every min. J. Blythe.
 Douglas Head, Isle of Man; white, fixed. Alexander M'Donald.
 Chickens Rock, Isle of Man; white, revolving every $\frac{1}{2}$ minute.

Thanks are due to the various observers for the careful way in which the schedules have been filled in. Excluding the *Natatores*, notes have been taken on about thirty species.

SEPARATE REPORT OF EACH SPECIES OBSERVED.

HAWK.—At Dhuheartach on Oct. 5th, two struck lantern at 8 a.m., light S.E. wind, and haze; and another on the 8th, at 7 a.m., calm, with fog. At Mull of Galloway, on July 18th, a Sparrowhawk was killed at 11 p.m., S.E., light and calm, thick haze; and one on Aug. 15th, at 1 a.m., wind variable, light air, fog and haze.

OWL.—I have only two records—one seen at Dhuheartach on May 30th, at 4 p.m., wind N.W., fog; and the other at the same place on Oct. 20th, at 3 p.m., wind E.S.E., fresh, with haze.

SWALLOW, *Hirundo rustica*, L.—The most northerly station noted this year on our west coast is Rhu Stoer, but two records here evidently refer to the spring migration, being June 6th and 10th, when two were seen on each day. The most northerly station noted during the autumn migration is Ardnamurchan; thence southwards at Skerryvore, Dhuheartach, Rhuvaal, Skervuile, Rhinns of Islay, and Loch Ryan. The earliest date on which they were recorded is 29th July, when one was seen at Dhuheartach at 6 p.m.; wind N., fresh, with clear weather. The latest record is Sept. 25th, when forty or fifty were seen at Rhuvaal, at 4 p.m.; wind S.W., fresh, with rain. The length of time thus occupied by the migration along the west coast of Scotland was, approximately, fifty-eight days. The greatest rush took place between the 20th Aug. and 25th Sept.; and, as far as shown, at Ardnamurchan and Rhuvaal. At Ardnamurchan, twenty rested all night on Aug. 20th, and left in the morning. At

Rhuvaal forty to fifty were seen, as related above. Swallows appeared to migrate principally when the wind is southerly (S.W. to S.E.), in light, variable, or fresh head- or side-winds, and hazy weather. Exceptions are found, however, at Dhuheartach on July 26th, when the wind was N., fresh, and weather clear; and at Skerryvore on Aug. 17th, when one appeared at the lantern about 10 p.m. (two hours after lighting up) in a N.W. light breeze, with showers. Swallows migrate mostly by day, resting all night. My returns show that they passed at all hours, but mostly before dark.

MARTIN, *Hirundo urbica*.—Martins are noticed at two stations only, viz., Butt of Lewis and Corsewall. The migration lasted between July 29th and Aug. 16th, or during eighteen days (but data are defective). They travelled during the day, resting around the lighthouses at night, with S. to S.E. and S.W. winds; the only one killed was when wind was N.N.E., at Corsewall.

WREN.—The records are few of this species: usually noticed on migration in large numbers; they appeared at Monach Island and Dhuheartach. The earliest date is Aug. 17th, when "some" struck at 10 p.m., and between that and 3 a.m.; wind W., and haze. The latest date is Dec. 9th, when one was seen at 3 p.m., with S.W. breeze, and showers. In fourteen years Mr. Edgar never saw a Wren at the Butt of Lewis lighthouse.

GOLDCREST, *Regulus cristatus*.—At Mull of Galloway on July 18th, alighting all night and resting. Mr. Edgar's letter of 20th Sept. supplies the information that he has never seen Goldcrests at the Butt of Lewis—a negative fact of value in tracing their exact lines of flight. Perhaps in our next reports observers will state in their remarks if any of the species noticed in this one have hitherto been rare, or entirely absent from their stations in past years.

ROBIN.—Appeared at Kyleakin, and thence southwards at Skerryvore, Rhuvaal, Skervuile, Rhinns of Islay, and Corsewall. The largest number recorded at Corsewall, where fifteen struck on Sept. 15th, at 11 p.m.; wind S.W., light breeze, and haze. The earliest date is Sept. 10th—one at Skervuile, at midnight; wind S.W., light, and cloudy. The latest is at Rhuvaal, on Dec. 4th at 9 a.m., when one was seen; wind variable, light breeze, clear. Thus, time occupied is between Sept. 10th and Dec. 4th. A rush took place in September between 10th and 21st, but no

large numbers are recorded; in October another rush between 7th and 18th; on the former date numbers migrated with Larks and other species not known, and many were killed and fell into the sea at Skervuile. At Skerryvore one seen at 7 p.m.; wind S., fresh, with fog and rain. In September I have records on six days at four stations; in October two at two stations, and in December one at one station—Rhuvaal; they passed or struck mostly at night or morning, but a few through the day; winds mostly southerly, and hazy or foggy; a few in cloudy and clear.

HEDGESPARROW.—At M'Arthur's Head, on Sept. 28th, one struck at 1 a.m.; wind N.W., strong, with haze and rain.

WHEATEAR.—Wheatears or "Stonechecks" are recorded from Skerryvore as the most northerly station this year, and thence southward at Rhuvaal, Skervuile, Turnberry, Corsewall, and Mull of Galloway. The earliest appearance noted is on Aug. 15th, and the latest on Sept. 28th; thus the migration extended over forty-four days. The greatest rush was between Aug. 17th and 22nd. The migration took place entirely at night, and principally with southerly winds—S., S.W., and to W.; fewer in northerly or easterly winds. The favoured stations were Skerryvore, Rhuvaal, and Skervuile.

ITMICE.—The negative information that Mr. Edgar never saw any Titmice at the Butt of Lewis lighthouse is worthy of record. I have notes of their occurrence at M'Arthur's Head and Lamlash; in each case a single bird struck the lantern, Nov. 16th and Aug. 17th, at 6 p.m. and 10 a.m. respectively; both during west wind, and light air.

FIELDFARE.—Occurred at Monach Island and Douglas Head, and is reported as usually seen at Butt of Lewis, though not this year. At Monach Island a number struck, and fifteen were killed, between 8 p.m. and 4 a.m., on Oct. 21st and 22nd; wind S.W., fresh, and drizzling rain. At Douglas Head one was seen on Oct. 16th, at 10 a.m.; wind N., moderate breeze, and cloudy.

THRUSH.—The most northern station is, for 1879, Isle Ornsay. Mr. Edgar; however, adds the general information that in most years the Butt of Lewis yields large numbers at the lantern; thence southward at Skerryvore, Dhuheartach, Rhinns of Islay, Lochindaul, Lamlash, Corsewall, and Point of Ayre. The earliest date is Sept. 19th, when a mixed flock of Thrushes and

Blackbirds passed in variable winds, and clear, at Lamlash. The latest date is Dec. 3rd, when "Thrushes" passed Lochindaul in the "daytime." - But this may be due to local influences and hard frost then registered. The next latest date is Nov. 24th, when one was seen in the daytime, 2 p.m.; wind N.E., fresh, clear; this would give sixty-six days for the passage, or, taking the later date of Dec. 3rd, seventy-six days. The rushes were on Sep. 19th (*ut sup.*); a "great rush" Oct. 21st to 28th. On Oct. 21st at Point of Ayr, two hundred "along with Blackbirds" seen at 1.30 p.m.; wind N. and N.W., strong, clear, with occasional showers. Also at the Rhinns of Islay, five seen, and so through records of Oct. 22nd, 18th to 28th, when three hundred "dark grey birds larger than a common Thrush !!?" (probably Missel Thrush, *Turdus viscivorus*) were seen at Point of Ayr; wind S.S.E., light, and hazy; and at Skerryvore about forty (of which ten killed) at 7 p.m.; wind S.E., light breeze, and haze. Thrushes travel with winds from S.E. to S.W. by preference, but also with winds from W. to N.E., through N.; observed most, as with most other species at lanterns, in hazy and rainy weather, but the great rush took place in "clear, with occasional showers," and "hazy and fine." Returns show that out of sixteen dates reported upon, only three show a diurnal migration, but one of these three is the rush of three hundred "dark grey birds larger than a common Thrush" † on Oct. 28th, at Point of Ayr.

BLACKBIRD.—The northernmost locality is Rhuvaal, where one struck on Dec. 1st, at 2 p.m., wind N.E., fresh; thence southwards at M'Arthur's Head, Skervuile, Pladda, Lamlash, Corsewall, Mull of Galloway, and Point of Ayr. The earliest date is Aug. 26th, at M'Arthur's Head. The latest date is Dec. 1st, at Rhuvaal. The time thus occupied by the migration was ninety-seven days. The rushes took place between 13th and 21st Oct., and the most favoured locality recorded is Point of Ayr, where on Oct. 21st two hundred "mixed Thrushes and Blackbirds" were seen at 1.30 p.m.; wind N.N.W., strong, and clear, with occasional showers. They were visible at the various stations in all winds, apparently from W. to E. and from S. to

† We shall refer to these under "Birds unknown," but we have thought it advisable to enter them here also; they can easily be erased in future comparisons if better data come to hand.

N.N.W. They appeared at all hours of the day and night, but most of the records apply to night migration.

STARLING.—The records of the Starling are very general; the most northern station given is Butt of Lewis, where the remark is made that they generally strike. This year, however, the most northern is Ardnamurchan Point, thence southward at Dhuheartach, Sound of Mull, M'Arthur's Head, Skervuile, Rhinns of Islay, Corsewall, Portpatrick, Mull of Galloway, and Point of Ayr. The earliest date on record is Aug. 11th, at M'Arthur's Head and Loch Ryan; at the former, one struck at 10 p.m., in S. wind, fresh, with haze; at the latter, two struck at 11.30 p.m.; wind E., light, with fog. The latest date is Dec. 18th, when one was caught at Skervuile at 11 p.m.; wind S.W., fresh, with haze. Thus the time occupied in passage was one hundred and thirty days, but the last date may have been due to local influence and keen frost at that time registered. The next latest date is Nov. 23rd, which would make the time spent in passage one hundred and four days. Rushes took place more frequently than with most species noted; thus, Sept. 19th, Oct. 12th to 25th, and Nov. 11th and 17th, may all be characterised as dates of rushes. The most favoured localities were Corsewall and Portpatrick, for frequency of records; and Ardnamurchan Point, Dhuheartach, Portpatrick, and Point of Ayr, for numbers of individuals. Starlings do not seem to have any choice of wind, as far as returns show. We find them migrating with N., W., and S.E. winds in almost equal proportions, with a preference—but very slight—to W. winds. They also pass or strike in E., S., and N.W. winds, but in fewer numbers. We do not think any deductions can be drawn from these data. But Starlings breed at many of the lighthouses or in their vicinity, so it is not always easy to determine whether, in every instance, they are on migration or not (as remarked by more than one reporter, *e.g.*, Mr. Edgar, at the Butt of Lewis, &c.). Out of seventeen dates reported on, only three show migration to have taken place during the day, viz., at Portpatrick (in two instances), and Ardnamurchan Point (3 p.m. in a gale).

FINCHES.—At Dhuheartach on Aug. 24th, one hundred were seen and twenty killed between 9 p.m. and 2 a.m., wind N.N.W., with haze; on Oct. 4th, six seen in afternoon, wind light and variable, with clear weather; again, on Oct. 8th, two were killed

at 7 a.m., calm, with fog. The above are all the returns of "Finches."

LINNET.—Only two records. At Rhuvaal on Sept. 9th, thirty to forty, old and young, were seen around the lantern at 10 a.m.; wind E. to N., breeze to stormy, with haze; and at Lamlash on same date and at same hour, fifty were seen; wind fresh breeze from W., and clear.

YELLOWHAMMER.—At Lamlash on Aug. 17th, one struck at 10 a.m., in light W. wind, and fog.

SNOW BUNTING.—At Monach Island, farthest north recorded, and at Dhuheartach and Corsewall. Earliest appearance Sept. 19th, when a flock was seen at Monach Island at noon, with S.W. light wind, and clear weather. Latest date Dec. 10th, when one was caught at Corsewall at 10 p.m.; wind variable, light, and haze; thus, time occupied was eighty-two days. A rush took place probably about Sept. 19th, when a flock was seen at Monach Island,—but our data are scanty,—and another about Nov. 10th, when a flock passed Corsewall. Other dates of record are Oct. 10th and 13th; they passed in N.W. and N. winds, in clear or cloudy weather; also in September in S.W., with clear weather, and variable wind, with clear or haze. All the records are during the night, except one at 12 noon, at Monach Island on Sept. 19th; wind S.W., clear.

LARK.—The most northern station noted this year was Dhuheartach, and thence southward they are noticed at M'Arthur's Head, Skervuile, Rhinns of Islay, Lamlash and Corsewall. The earliest date is Aug. 17th, when twenty struck at Dhuheartach between 10 p.m. and 3 a.m.; wind W., with haze. The latest date is Dec. 6th, when one struck at 9 p.m.; wind S.E., fresh, and haze, at Corsewall; the time thus occupied was one hundred and twelve days (but the last was no doubt due to the severe frost inland at that time). The previous date is Nov. 18th, which would make the time only seventy-nine days. The greatest rush appears to have been in October, about the 12th to 24th, but the numbers observed are so small that it is difficult to judge. The locality most favoured was Dhuheartach, whence I have returns on eight different dates, between Aug. 17th and Nov. 24th. An earlier rush took place about Aug. 17th to 21st, at Dhuheartach and Skervuile. A later rush about Nov. 15th to 18th at Dhuheartach, Skervuile, and Rhinns of Islay,

but of small dimensions. Larks appear to migrate principally when the wind is W. to S.W., or late in the season, when still more southerly, say S. Exceptions occur at Dhuheartach on Nov. 24, when wind was N.E., fresh, and weather clear; at Rhinns of Islay on Nov. 7th, wind N.W., light breeze; at Skervuile on Oct. 10th, when wind was N.; they migrate in calm, variable, light, or fresh winds, and are noticed at lanterns principally in haze and fog. They migrate mostly at night, at all hours, but the majority pass between 7.30 p.m. and 4 a.m. Those passing during the day were travelling when the wind was N. or N.E.; those passing at night when the wind was S. to W. So the returns show; but whether this indicates any *law of migration* or not remains to be proved by further observation.

LAPWING.—The most northern station which they were observed to pass at this season was Rhu Stoer; thence southward, they are reported at Isle Ornsay, Lochindaul, Devaar, Pladda, and Portpatrick. The earliest date given is Aug. 20th, when "flocks" were seen during the day in N. wind and clear weather; the latest is Dec. 11th, when one was killed at Pladda, at 2 a.m., wind S.E., light breeze, with haze. The next latest date given is Nov. 14th, when twenty-two were seen at 8.30 a.m. at Portpatrick, wind S.E., and haze. The time occupied, therefore, this year is from eighty-six to one hundred and thirteen days. Rushes took place about the 20th to 25th August, when several flocks passed Isle Ornsay and Lochindaul; again, Sept. 16th to 25th, a flock at Devaar, Portpatrick and Chickens Rock; another rush at Rhu Stoer, Portpatrick and Lochindaul about Oct. 27th. Lapwings travelled in clear or haze, rain, or showers, principally in S. and S.E. winds, on the west coast; but also in N. wind on Aug. 20th, and in W. and S.W. at Rhu Stoer and Lochindaul on Oct. 23rd and Nov. 1st respectively. They appear to travel equally by day and night.

PLOVER.—Three stations give returns of this species, viz., Skerryvore, Rhinns of Islay, and Portpatrick. The earliest date is July 27th, at Portpatrick. The latest date is Oct. 18th, at Skerryvore. The time thus occupied by the migration was fifty-three days. The principal rush took place about the beginning of September, and the favoured station was Portpatrick, where they were always observed passing inland with a S. to S.W. wind, light or strong breeze, during the daytime. Individuals struck

lantern of Rhinns of Islay at night, when wind was N., N.W., or S.E.

OYSTERCATCHER, *Hæmatopus ostralegus*.—At Isle Ornsay on Nov. 18th, one struck at 10.30 p.m.; wind S., light, with haze, and rain.

HERON.—At Dhuheartach on Oct. 8th, one seen at 7 a.m.; calm, fog. At Rhuvaal, Oct. 1st to 30th, "Storks" (afterwards identified as Herons) passed at 9 a.m.; wind variable, light, with showers.

CURLEW.—Island Glass is the most northern station noted for this species; southwards at Dhuheartach, Pladda, Portpatrick and the Mull of Galloway. The earliest date recorded is Aug. 3rd, when eighteen were seen passing Portpatrick at 10 a.m., wind E.S.E., strong breeze, with haze; the latest date is Nov. 20th, when eight were seen passing Island Glass, flying southward, at 2 p.m., wind light S.W., with clear weather. Thus the time occupied was one hundred and nine days. A rush took place in August—say 3rd to 26th—and again in November, 15th to 20th. Dhuheartach seemed to be a favourite station. Curlews migrated in all winds, and "boxed the compass" from E.S.E., through S. to S.W., W. and N.N.W.; they passed mostly at night. Two exceptions were at 10 a.m. on Aug. 3rd, and 2 p.m. on Nov. 20th, at Portpatrick and Island Glass respectively.

WHIMBRELS ("Small Curlews"), *Numenius phæopus*.—At Lochindahl on Sept. 20th, seen for several days in flocks; wind S. to W., and rainy.

SANDPIPER (sp. ?)—At Rhinns of Islay on Aug. 22nd, one struck at 1 a.m.; wind S.E., light, and haze.

TURNSTONE, *Strepsilas interpres*.—At Rhinns of Islay on Nov. 8th, one struck at night; wind S.W., fresh, and haze.

SNIPE.—At Isle Ornsay, a single Snipe takes position as the northernmost recorded at the lighthouses of the west coast in 1879, as late as Oct. 20th, killed at 10 p.m.; wind N., clear. Thence, records at Skerryvore, Dhuheartach, Rhinns of Islay, Pladda, Mull of Galloway, and Douglas Head. The earliest date, Aug. 20th ("sp. not known"), 4 a.m. at Pladda; wind S.E., strong breeze, and haze.† As a doubt occurs, next earliest date—a long jump later—is Oct. 11th at Rhinns of Islay, when one was killed between 12 p.m. and 3 a.m.; wind N., light, with haze.

† This may have been a Sandpiper.

The latest date is Nov. 15th, when, at Rhinns of Islay, sixteen were killed between 6 p.m. and 4 a.m., wind S., breezes and haze; and another record occurs at Pladda. Thus from Oct. 11th to Nov. 15th marks thirty-five days for passage. Snipe are thus seen to make a rapid passage. (Local migrations occur earlier from moors to lowland marshes in Scotland, September always producing home-bred birds in our lowland marshes.) Rush of foreign birds middle of November, 1879, as far as we can judge; but on Oct. 18th "numbers" kept about all night round lantern of Skerryvore; wind S.E., light breeze, fog, and rain. Migration mostly at night, judging from records, but also by day.

WOODCOCK.—The northernmost station on west coast in 1879 is Island Glass; thence southwards at Dhuheartach, Rhinns of Islay, Lochindaul, Devaar, Corsewall, Mull of Galloway, and Douglas Head. Small numbers recorded in all cases, except at Lochindaul, when about forty passed during the daytime on Dec. 12th, when the wind was variable, light, and the weather clear. The earliest date was Oct. 11th; one killed at Rhinns of Islay, at 10 p.m., wind N., light, clear; the latest Dec. 12th. Too few data to fix rushes, except the one in December, which no doubt was directly caused by the severe frosts then recorded; wind N. and W., except on two occasions, on Oct. 7th at Douglas Head, wind E.; and on Oct. 30th at Mull of Galloway, wind E.; and on two others, viz., variable and light, when (in the hard frost) the forty were seen.

CORN CRAKE, *Crex pratensis*.—Heard for first time at Lochindaul, June 2nd; at Kyleakin, June 9th, wind S.W., clear; and at Skerryvore, June 20th, wind strong S.E., with fog.

WILD GEESE (sp.?).—At Monach Island a flock "mixed old and young" passed south at 10 a.m. on Dec. 13th, wind S.S.W., fresh breeze, with haze; this is the most northerly station noted. Thence southward they were seen at Kyleakin (passing N.W.) at 8 a.m., wind N.W., fresh breeze, and clear weather; also at Sound of Mull, M'Arthur's Head and Devaar. The earliest date is Aug. 17th (passing N.W.), and the latest Dec. 15th (twenty-four passing W., at Sound of Mull). A migratory movement is thus seen to have extended over one hundred and nineteen days. A rush took place on Oct. 20th and 21st, at Sound of Mull and M'Arthur's Head; and again on December 13th, 14th and 15th, at Monach Island, M'Arthur's Head, and Sound of Mull.

respectively; the direction of their flight was usually W. or N.W. On Dec. 13th a flock passed S.; most passed with a S., S.S.W. or S.W. breeze, in cloudy or clear weather; in two instances with a N.W. wind. They were observed during daylight.

WILD SWAN.—At Devaar on Dec. 11th, six seen at 4 p.m., light airs, with haze; and on Jan. 4th, three were seen flying south, in clear weather, at Rhuvaal lighthouse. We say nothing of the reported occurrence of *Cygnus americanus* on our coasts, but think the record (p. 111) premature.

WILD DUCK.—At Butt of Lewis a Duck was killed on Dec. 1st, at 8 p.m., wind E., light and clear. Others occurred in November and December at Rhuvaal and Devaar. At Rhuvaal, between Nov. 1st and 30th, three or four hundred Ducks passed between 8 a.m. and 3 p.m.; wind variable, light, and showery weather. Most of the migration seems to have been observed through the day. In none of the reports are the species identified, being described as either "Ducks" or "Wild Ducks."

WIDGEON, *Anas penelope*.—At Monach Island on Oct. 27th, a few were seen at 12 noon; wind S.S.E., fresh, and clear.

SHELDRAKE, *Tadorna vulpanser*.—At Pladda, on May 23rd, six (two males and four females) seen at 1 p.m., wind N.E., light, and haze; remained on the island till the middle of June.

EIDER DUCK.—At Rhu Stoer on June 30th, two males and two females seen at 11 a.m.; wind S., fresh breeze, showers. At Dhuheartach on Dec. 3rd, twenty seen at 10 p.m.; wind N.E., light, clear. At Devaar on Dec. 13th, twelve seen at 1 p.m.; wind N.N.W., light breeze, haze.

STORM PETREL.—At Butt of Lewis in July, August, and September, an occasional bird at the glass, always at night, always in hazy or rainy weather, generally "haze and rain" together; wind in three out of four instances S.W., and once on July 3rd, W.N.W., stormy. At Rhu Stoer a good many were observed "not on passage" between 17th and 20th Aug. between 6 p.m. and 10 p.m., wind N. to E., light, haze and rain; and at Rhinus of Islay on Sept. 17th, one struck at 2 a.m., wind S., light, and haze.

SEA-FOWL.—The following notes upon sea-fowl as observed at several stations—notably at Cape Wrath—will, we think, prove interesting:—At Cape Wrath, Mr. M'Gill reports all the sea-fowl as deserting their breeding-haunts there on Aug. 16th, and both

old and young flying westwards. He roughly estimated the numbers which passed within his ken as follows:—300 to 400 Guillemots, 800 to 900 Razorbills, 800 to 900 Puffins, 100 Scarts, and 300 Sea-gulls. This was performed in an east wind, during hazy or rainy weather (see also under Solan Goose), and all left Cape Wrath in one day and about the same time, viz., 10 a.m. The Gulls passed continuously between 9 a.m. and 3 p.m. Notes from other stations can hardly be considered as applying to anything but local daily migration in search of food, as is constantly witnessed at any rock-bird station on the coast; thus, at Rhu Stoer large numbers passed towards S.W., and are specially noted on June 12th to 15th; also at Kyleakin, a large flock passed southward at 2 p.m., wind S.E. When at the Shiant Isles this summer, at the end of June, I witnessed a regular departure of thousands of Puffins to their feeding-grounds in the Little Minch, about 9 to 10 a.m.

SEA GULLS.—At Cape Wrath on Aug. 16th, three hundred passed west between 9 a.m. and 3 p.m.; wind E., haze, and rain. "Sea Gulls bred at the station, and all left on the same day, both young and old. The migration goes all to the west."

KITTIWAKE, *Rissa tridactyla*.—At Skervuile on May 31st, two at noon flying north; calm, clear.

TERN.—At Dhuheartach, six seen on the evening of Aug. 27th, wind S., cloudy; and four at the same station on the morning of Sept. 4th.

BIRDS UNKNOWN.—At Portpatrick on July 12th, a flock of small birds passed overhead at 8.30 a.m., wind S.S.E., fresh, and rainy; and on Oct. 13th a flock passed inland at 4.20 p.m., wind S.W., and rain; on Nov. 13th "a flock of birds not known" passed inland, wind E. by N., and clear. At Pladda on Aug. 20th, one Snipe, species not known, at 4 a.m., wind S.E., strong, and haze; and another on Nov. 15th. At Skervuile, on Nov. 14th, a number from 10 p.m. to 2 a.m., wind variable, light, and haze; and others on Oct. 7th at Skervuile; "many killed and fell into the sea."

RED-BREASTED MERGANSER.—At Corsewall, on July 20th, a "strange Duck" (since identified as a Red-breasted Merganser) was killed at glass at 2 a.m.; wind E., light, with haze.

SOLAN GOOSE, *Sula bassana*.—At Cape Wrath and other stations upon our coasts, an extraordinary annual migration of

Solan Geese is witnessed. Mr. M'Gill has reported to me specially on that of 1879, and kept as accurate a record as possible of the numbers which he estimated to pass westward. He writes as follows:—"The number of Solan Geese that migrate past Cape Wrath is beyond anyone's power to number, but I have come as near to it as possible. The first half of July the flocks were composed of old birds, and the rest of the time they were mixed old and young." Mr. M'Gill then gives the following list of Solan Geese seen passing west on fifteen days, between 14th July and 9th August, which I reproduce here:—

July 14th.	600 to 700.	9 a.m. to 8 p.m.	Wind E.	Clear.
" 15th.	200.	9 a.m. to 8 p.m.	" E.	Haze.
" 16th.	40 to 90.	12 noon to 7 p.m.	" E.	Haze.
" 22nd.	200 to 400.	10 a.m. to 7 p.m.	" N.-N.E.	Fog, rain.
" 24th.	100 to 200.	8 a.m. to 6 p.m.	" S.W.	Clear.
" 26th.	300 to 400.	11 a.m. to 7 p.m.	" S.W.	Haze.
" 28th.	90 to 100.	7 a.m. to 8 p.m.	" S.W.	Haze, rain.
" 31st.	60 to 80.	10 a.m. to 5 p.m.	" S.	Haze, showers.
Aug. 1st.	100 to 300.	8 a.m. to 6 p.m.	" W.	Haze, rain.
" 3rd.	300 to 400.	9 a.m. to 6 p.m.	" E.	Clear.
" 4th.	60 to 70.	10 a.m. to 7 p.m.	" E.	Fog, clear.
" 5th.	20 to 30.	8 a.m. to 5 p.m.	" N.E.	Fog, rain.
" 7th.	40 to 50.	9 a.m. to 6 p.m.	" N.	Fog, rain.
" 8th.	20 to 40.	8 a.m. to 7 p.m.	" N.	Fog, rain.
" 9th.	20.	9 a.m. to 5 p.m.	" N.	Haze.

Thus it will be seen that from 2150 to 3080 were estimated to pass westward within view of Cape Wrath, between July 14th and August 9th, during fifteen days occupied on migration. All which were observed passed during the day—say between 7 a.m. and 10 p.m.—and apparently in all winds and weather. From the Butt of Lewis Mr. Edgar supplies the general information that the Solan Geese pass the station, arriving first in May, and leaving in the latter end of October, but giving no particulars as to direction of flight. At Mull of Galloway Solan Geese are reported as passing, on July 19th, in flocks. Mr. N. B. Morrison reports as follows:—"Saw them flying past to W.S.W. in wedge-shaped flocks as if on a passage, or changing locality." This was during the forenoon; wind S., light, and haze. "At 1 p.m. it began to rain, and continued for twenty-four hours; rain guage at 9 a.m. of 20th, 1.72 inches. On 21st, 22nd, 23rd, and 24th,

very strong breeze, and showers; wind W.N.W. to S.W." Again at same station (Mull of Galloway) flocks continued passing all day; wind S.E., fresh, fog, and rain, flying in same direction. On 8th and 9th, wind S., gale; 10th, wind W., strong. In a later note Mr. M'Gill believes "that the Solan Geese strike the land first at Cape Wrath," and that the Geese which pass it are from Suliskerry.

On the west coast of Scotland, also, many observers make particular mention of the scarcity of autumnal migrants in 1879. At several principal and important stations this scarcity is of course most remarked upon, such as Butt of Lewis, Monach Island, Island Glass, Skerryvore, and Dhuheartach. During long experience at these and other stations, the several observers do not remember such great scarcity of birds during the autumn migration. From other observers' remarks it would appear that several of the west coast stations are not suitable for observations being made, from their land-locked situations or other local influences, such as Kyleakin, Sound of Mull, Corran Ferry, and others.

Many birds are killed at the lanterns of the more isolated lighthouses and are blown into the sea. Thus, in 1877, at Skerryvore, in the month of October, the number of birds killed was six hundred, chiefly the Common and "Mountain Thrush" (Ring Ouzel), but including also Blackbirds, Snipes, Larks, and one Wild Duck. The observer, Mr. W. Crow, was of opinion that about two hundred more were killed and blown into the sea. They came every night from the 1st to the 6th, about 8 p.m., and went away at daylight. "I would estimate," he says, "the number about the light on each of the above nights to be about a thousand." The direction of the wind was from S.S.E. to S., with haze; and no migration of birds was observed during the day. On Dhuheartach lighthouse rock, "two Hawks are seen every morning" while the migration lasts, which come to prey upon the small birds resting on the rock. A considerable flight of migrants took place about Oct. 7th, as upon the east coast.

The direction of the flight of migrants appears to be from east to west at the north coast stations, but from N.W. and N.N.W. to S.W. or S.S.W. at the stations farther south; and this is borne out by previous observations in former years by my

west coast observers at Tyree and elsewhere. Our observers have not usually reported the direction taken by the migrants, but there are enough data to prove the above lines. It would appear, therefore, that birds when passing from east to west often overshoot the land, and are compelled to turn back upon a new course, according to the direction of the wind. In 1878, Mr. W. Boyd (since deceased) wrote regarding the migration in Mull as follows:—"In the month of October I was fishing on Loch Assapol, near Bunessan. Almost every day I saw flock after flock of little birds—Larks, Buntings, Robins, and even Wrens—flying across the loch. All these birds were steering the same course, having apparently come from the outlying Hebrides, *via* Tyree, Iona, up the Rose of Mull, and were steering for the mainland. Fresh arrivals of different species of Ducks rested and then passed on. Wild Swans and Geese were seen far up in the air, all taking a bee-line for the south." On another occasion Mr. Boyd visited Tyree in December, 1878, and both he and a companion remarked "the extraordinary scarcity of common birds, and the unusual number of winter visitors. One day every Snipe they put up, instead of flying a bit and settling again, rose high in air, and went off due south-east as far as they could see, right across the sea, to Mull. The remark was then made, "The sooner we go south for powder and provisions the better; we are going to have an arctic winter," which, as is well remembered, was a perfectly correct surmise. It will thus be seen that the flights of wildfowl almost invariably are from N. to S. on both coasts, but that the smaller birds—land birds—as they fly lower, are more influenced by the configuration of the coast-lines, and also, no doubt, by the direction of the wind at the time. Our data are at present too scanty to lay down with precision the minutiae of their lines of flight, but another year's observations will probably greatly assist us. The same rules, as to time of day or night at which birds strike the lantern, holds upon the west coast which also obtain on the east, and the same remarks as to weather also hold good.

The above remarks upon the direction of the flights upon our west coast may prove of value in a comparison with Mr. Cordeaux's notes upon the direction of the flights at the Galloper Bank. We are aware here that birds pass overland on migration, crossing Scotland between the Firths of Clyde and

Forth, as they have been heard on calm nights crying as they passed over from W. to E., or from points N. of W. to points S. of E.; and day-flights have often been observed passing here from N.N.W. towards S.S.E., or from N.W. to S.W. I would instance here Bramblings, *Fringilla montifringilla*, natives of Northern Europe. (See Gray's 'Birds of the West of Scotland,' p. 137. The "column" of Bramblings there described as on migration were not "proceeding in a north-easterly direction," however, as stated by Mr. Gray, but were coming from a north-westerly direction, and were proceeding in a south-easterly direction.)

NOTES ON THE ORNITHOLOGY OF THE BRITISH POLAR EXPEDITION, 1875-6.

By HENRY CHICHESTER HART,
Naturalist on Board H.M.S. 'Discovery.'

(Continued from p. 129.)

SANDERLING.—*Calidris arenaria*.—On the 10th August, 1875, I saw six or seven Sanderlings near Walrus Island, in lat. $70^{\circ} 25'$. In Discovery Bay they were very rare. On the 1st June, on the 27th July, and on the 12th August, 1876, single specimens were seen. On August 22nd I saw a few in Rawlings Bay, lat. $80^{\circ} 22'$; and on the 7th September I saw a few in the same locality, as on the 10th of the previous August. I was not able to obtain a nest of this species, though my colleague, Capt. Feilden, found one on June 24th, in lat. $82^{\circ} 33'$ N. ('Ibis,' 1877, p. 406). Dr. Coppinger thought Sanderlings were common, and breeding, in Polaris Bay.

RED-NECKED PHALAROPE, *Phalaropus hyperboreus*.—Upon the 9th and 10th July I saw several pairs of this Phalarope at Blæse Dalen Lake in Disco. They were breeding amongst sedges on its shores in company with the Lapland Bunting and the Long-tailed Duck. I watched them for some time; they are extremely graceful in their movements upon the water, and while swimming about in search of minute aquatic insects were quite fearless, coming to within a foot or two of the bank whereon I stood. I found one nest, a loose fabric of grasses and sedges, on the ground amongst tufts of *Carex frigida* and *C. fuliginosa*. It

contained four eggs, which were unfortunately broken while I was swimming a torrent that intervened between Blasé Dalen and Godhavn. The eggs, which were nearly hatched, were somewhat similar to those of the Ringed Plover, *Ægialitis hiaticula*, but smaller, rounder, and with bolder markings. A weak, low, plaintive whistle was the only note I heard the bird utter.

KNOT, *Tringa canutus*.—On the 4th August, 1875, I saw half a dozen Knots in Hayes Sound, lat. $78^{\circ} 56'$, and on the 25th, several were feeding along the shore, in company with Turnstones, in Discovery Bay. In the following year the first Knot I saw was upon the 31st May; after that they became frequent. On their first arrival, and until absorbed in their breeding duties, they were very wary, often feeding far inland by the loneliest swamps and pools. A pair of Knots which had evidently selected a breeding-place, upon finding they were watched, deserted the site entirely. When courting, Knots play with one another upon the wing, and upon the ground, in a most entertaining manner, pursuing, avoiding, and encouraging one another; while the clear, sweet flute-like whistle of the male is frequently heard. Later in the year, July 11th and 12th, when the young ones were just hatched, I was much interested in watching the parents carrying on the same manœuvres as the Lapwing to decoy the intruder from the young; running along the ground with outspread wings, feigning lameness, and taking short flights to re-alight suddenly close to one's feet. In spite of most pains-taking search and the offer of liberal rewards, all efforts to obtain the eggs of the Knot were unsuccessful. Upon the 11th July a brood of four, disturbed from the nest, were captured and brought on board alive. The nest was placed under a large flat stone, resting on two others which formed a sort of gangway; it was merely of leaves and dry grass, loosely laid together on the earth by the edge of a stream; I could find no trace of the egg-shells. Upon the following day three more young were caught; these were apparently a couple of days out of the shell, grotesque little things, very lively and active, with large dark eyes, the body very small, and the wing-pinions just showing. Their feet were almost as large as those of the full-grown bird, and they were able to run at a marvellous rate. Both the young broods were found three or more miles inland, and in each case close to a stream. Of a number of Knots' stomachs examined,

only one contained any food; this consisted of two caterpillars, (*Dasychira grænlandica*, Wocke), one bee, and pieces of an Alga (*Glaecapsa magna*, Klr.). Dr. Coppinger saw Knots frequently in Polaris Bay during July, 1876; he met with one brood of five young together among stones.

ARCTIC TERN, *Sterna hirundo*, L.—In the end of June, 1875, many of these birds were seen seated on floating pack ice drifting out of Baffin's Bay. Terns were observed in the first week of August in Hayes Sound. The first Arctic Terns were met with in Discovery Bay in 1876, on the 23rd June; afterwards they became frequent, breeding along the shore on the bare shingle in several places; one nest with four eggs was found in Discovery Bay. On several occasions I watched these birds fishing for small fry of the Charr (*Salmo alipes*, Rich., *S. Naresii*, Günt.) in the large lake inland of Musk-ox Bay, lat. $81^{\circ} 46'$; but their chief food was upon green caterpillars, *Argynnus chariclea* and *Tipula arctica*; stomachs examined sometimes contained over a dozen caterpillars. Dr. Coppinger stated that Terns arrived in Polaris Bay in flocks of twenty or thirty in July; not, as a rule, breeding there. He found one nest, however, and described the parents as being unusually fierce in their endeavours to protect it.

IVORY GULL, *Pagophila eburnea*.—On the 19th August I saw birds of this species north of Cape Frazer, in lat. $79^{\circ} 42'$; they were probably breeding somewhere in the neighbourhood; they kept flying and screaming about the cliffs, and I watched them for some time, but the locality was inaccessible, and no search could be made for a nest. On the 30th July, 1876, I saw an Ivory Gull in Discovery Bay; after that date they became frequent, and were incessantly harassed by the Long-tailed Skua. These birds came northward after the breeding-season was over, there not being water in Discovery Bay to support them in the earlier months, when the other migrants made their appearance. All seemed adult birds, none of the spotted young having been observed. In Polaris Bay Dr. Coppinger observed a couple of pairs late in the season, but obtained no evidence that they bred there.

GREATER BLACK-BACKED GULL, *Larus marinus*.—I saw several of these birds at the end of June, 1875, upon floating ice in Baffin's Bay.

KITTIWAKE, *Rissa tridactyla*.—Kittiwakes were numerous in Baffin's Bay at the end of June. On the 16th July, 1875, I found this gull breeding in considerable numbers in Svarte Vogel Bay, lat. $69^{\circ} 42'$, in company with Glaucous Gulls, Iceland Gulls, Cormorants, Looms, Rotches, Dovekeys, and Razorbills, the last-mentioned bird being the least numerous. Kittiwakes were not seen north of Foulke Fiord, lat. $78^{\circ} 18'$, where I obtained a specimen and saw many more. I had no doubt they were breeding in this locality, which is apparently their northern limit.

ICELAND GULL, *Larus leucopterus*.—On July 16th, 1875, I took a young bird and an addled egg of this species from the same nest in Svarte Vogel Bay. The eggs were very like those of the Common Gull, the young bird being of a pale greyish brown colour. There were many Iceland Gulls in Svarte Vogel Bay.

GLAUCOUS GULL ("Burgomaster"), *Larus glaucus*.—On the 16th July, 1875, there were many pairs, usually isolated, breeding along the shores of Svarte Vogel Bay. Constantly on the topmost spire of some pinnacled iceberg, this handsome gull takes up his position alone, the lower ledges being crowded with multitudes of meaner birds. In Foulke Fiord there were many pairs, where I observed them foraging several miles inland: they are very voracious, and seem to be able to subsist independently of any open water, probably often depending upon Lemmings and other land animals for their food. Upon the 14th June, 1876, I saw a pair flying inland from Discovery Bay; this pair had, I believe, a breeding-place somewhere in the neighbourhood, as I saw them frequently at intervals till August 1st; they seemed to subsist entirely inland, and made their appearance before there was any open salt water. I watched this pair several times sitting on, and hovering about, a fresh-water stream between two inland lakes in Musk-ox Bay, apparently fishing for Charr. Dr. Coppinger saw one Glaucous Gull in Polaris Bay in July, 1876.

RICHARDSON'S SKUA, *Stercorarius crepidatus*.—In the month of June this bird was frequently seen in the North Atlantic, persecuting various Gulls. On the 10th July I watched a pair for some time near the small fresh-water lake a few miles inland, in Blase Dalen, Disco. I shot the male, and believe that they had been breeding in the neighbourhood.

POMATORHINE SKUA, *Stercorarius pomatorhinus*.—On the 15th and 16th September, 1876, I saw several of these birds in

lat. 72° to 73° , in the waters near Pond's Inlet. This was by no means the commonest Skua in any locality we visited, and was not observed to the north of the above latitude.

BUFFON'S SKUA ("Long-tailed Skua"), *Stercorarius parasiticus*.—The first arrival of this species in Discovery Bay was on the 28th May, 1876. They had already commenced to quarrel with the Snow Buntings. On the 5th June fresh numbers arrived, and by the end of the second week of June they were very common; one shot on the 7th June proved to be a female containing fully-formed eggs. As far as my actual observation went, these Skuas subsist entirely upon Lemmings, numerous specimens which I dissected containing remains of this animal alone; they seem, however, in all cases to reject its entrails, which probably possess some unpalatable or poisonous secretion. I have watched a Skua rapidly tearing out the viscera, and then devouring the rest of the body; and I have frequently found the discarded remains about lemming-grounds around Discovery Bay and its neighbourhood. I am inclined to think, however, from the extreme dislike shown to them by all other birds, that these Skuas are in the habit of destroying the nestlings of their neighbours. Skuas insult the Snowy Owl in the most gross and daring manner, defiantly flapping their wings and tail into its face and eyes. I found many nests and eggs of this Skua in Discovery Bay and its vicinity; the eggs are two in number, except in very rare instances, once three eggs having been found, and another time a single bird having been hatched. They make no nest whatever, laying their eggs upon the ground sometimes where it is bare, sometimes where thinly clad with herbage. The eggs are olive-green, sometimes with a brown hue, in their ground colour, rather thickly spotted and blotched with chocolate or blackish brown, and often marked with a few streaks of the same colour, especially at the larger end. The colouring is very variable, some that I have seen being like miniature Guillemot's eggs. The size is about that of a Kittiwake's egg, somewhat more pointed; the shell is remarkably thin. The first eggs were found on the 27th June. These Skuas are most courageous birds in defence of their nests; they will fly fearlessly at one's face, and in this act were often knocked down with the gun-barrel, sticks, or stones, their flesh being in much request for the ship's men. Skuas hover like a Kestrel, with tail and wings expanded, while

scanning the ground for Lemmings; in that position the two long feathers projecting beyond the outspread tail are very remarkable. When the visitor is at a little distance from the nest, the note of the Skua is exactly like the whine of a young puppy. On getting nearer this becomes a harsh, and at length deafening, screech. Skuas' eggs are easily to be found when the habits of the birds are understood, though from the uniform monotony of the ground's surface, and their being laid on the bare earth, it would otherwise be a matter of chance. At a couple of hundred yards from the nest, one of the birds—I believe the male—flies to meet the intruder; at about a hundred yards the hen, having left the nest, joins in; and then the attack and the din begin, rising or falling regularly as the nest is approached or departed from. At length, when both birds become uncontrollably enraged and audacious in their attacks, one may be certain the eggs are close by. I have often found their nests thus, scarcely troubling myself to look at the ground until the proper moment had arrived, and I was then tolerably certain to find their eggs close by my feet. By the 7th July the young were beginning to chip their way through the shell, and in a few days more were hatched. Some of our Esquimaux dogs became such skilful hunters after young birds, that those which had escaped from the shell had even a worse chance of subsequently preserving their existence. Hence young birds of any species were of great rarity. I have also observed that the Arctic Fox eats the Skuas' eggs as well as those of the Snowy Owl. Skuas are most powerful and graceful flyers, and seem to be more than a match for any of the animals of these regions: they will attack hares; I have watched a pair beating one about the head with their wings in so cruel a fashion that it seemed quite merciful to shoot it. In the late summer I have seen, on one or two occasions, these birds alighting on, and sitting for some time upon, fresh water in the neighbourhood of Discovery Bay. In the early season both sexes have the under parts from beak to vent snowy-white, with a tinge of golden yellow upon either side of the upper part of the neck. The breast becomes gradually clouded during the breeding-season, and before its close, the white feathers of the upper part have become brown. Before leaving their breeding-haunts the majority of these birds have their brown zone conspicuous above the white of the belly; it varies much, however, in extent and

intensity in different individuals. Both sexes take their turn in hatching; their cries and their flight are exactly alike; both fly at the intruder with equal courage, and, as far as I could observe, from examining a large number of specimens, they are similar in size and colour throughout the breeding season. A character, however, by which the sexes may be almost invariably distinguished, is the superior length of the long tail-feathers in the male. I have several times shot one bird of a pair and found its sex agreeing with my expectation from having observed this distinction when in flight. In the female, the two long tail-feathers are six inches, or a shade more, exceeding the shorter, while in the male there is a difference of at least seven, and in some cases eight inches in their respective lengths. In Polaris Bay, Dr. Copperger observed a few pairs of this bird breeding in July, 1876.

FULMAR PETREL ("Molliemoke"), *Procellaria glacialis*.—On the 12th June, 1875, in lat. $52^{\circ} 28'$, I caught a Fulmar with a line and hook baited with a piece of fat. These birds are often so caught by sailors; they invariably get sea-sick when they are placed on deck, from which they are unable to raise themselves by flight. This specimen was much infested with small mallophagous ticks. From this point northwards, Fulmars were frequent and often abundant about the ship, especially upon floating ice in Baffin's Bay, and as far north as Cape York, lat. 76° . Afterwards they decreased in numbers up to Cape Sabine, in lat. $78^{\circ} 45'$. The first Fulmars which I observed on our homeward journey were seen upon the 11th September, 1876, in the neighbourhood of Whale Sound, in lat. $77^{\circ} 10'$.

ARCTIC SHEARWATER, *Puffinus major*.—Small flocks of this bird appeared about the ship on the 16th June, 1875, in lat. $52^{\circ} 23'$; after that they were frequently observed until the 26th June, when I saw them for the last time in lat. 58° , about a hundred miles south of Cape Farewell.

STORMY PETREL, *Procellaria pelagica*.—From the 5th to the 23rd June, lat. 53° to 59° , these birds were generally to be seen skimming the water in the neighbourhood of the ship. A little south of Cape Farewell, and a couple of degrees to the eastward, I lost sight of them until the 1st July, when I saw two Stormy Petrels off Godhaab, on the coast of Greenland, in lat. 64° . The occurrence of this bird in the Greenland seas has been disputed.

Upon several occasions I watched Stormy Petrels remaining quiescent for upwards of a minute upon the surface of the water, the wings being nearly closed, and the bird evidently at rest. Sailors catch Petrels by dangling out a bottom of fine thread astern, in which they entangle their wings; it is considered, however, most unlucky to kill them.

PUFFIN, *Fratercula arctica*.—On July 1st, 1875, I saw two Puffins as far north as lat. 64° , on the coast of Greenland, near Godhaab.

BLACK GUILLEMOT ("Dovekey"), *Uria grylle*.—First met with in lat. $63^{\circ} 24'$ on the 1st of July. Afterwards their breeding-places were noticed at various localities as far north as Bessel's Bay, in lat. $81^{\circ} 4'$; as about Upernivik and Kangitok; at Norman Lockyer Island and in Hayes Sound; in Dobbin Bay and at Cape Frazer. In 1876, the first Dovekeys were seen in Discovery Bay upon the 22nd July. I do not think they bred in the neighbourhood, there being no open water for them to subsist in, in the early part of the season. These birds did not associate in large flocks like other Auks and Guillemots. Dr. Coppinger observed a few Dovekeys at Polaris Bay and in Petermann Fiord in July, 1876. During his sojourn there, eight were shot for the sick. Tracks and open places in the ice seem, however, to appear earlier upon the opposite shore than upon that of Discovery Bay.

BRÜNNICH'S GUILLEMOT ("Loom"), *Alca arra*.—On July 16th I gathered Looms' eggs in Svarte Vogel Bay. These birds bred here in multitudes, nor did I observe any other species in immediate company with them, though other birds would inhabit the same range of cliffs, and isolated pairs of Glaucous Gulls bred here and there overhead near their summits. A number of these birds were shot for the consumption of the ships' crews at Sanderson's Hope, in lat. 72° —a magnificent wall of sheer cliff over a thousand feet in height, containing the most noted of the Greenland "loomeries." Boats started from both ships, but a heavy swell rendered our attempts less successful than we had anticipated. These birds make a very tolerable stew. Eggs were also obtained from Upernivik; they are very strong-flavoured and by no means inviting, the white when boiled being transparent and gelatinous, and the taste stronger than that of a duck-egg. Looms and loomeries were observed north of lat. 79° , at Cape Alexander. This species seems to replace our Guillemot in high

latitudes; the latter, apparently, does not occur at all in Greenland.

LITTLE AUK ("Rotch"), *Mergulus alle*.—A few Rotches were found breeding in Svarte Vogel Bay on July 16th, 1875. On the 25th they were very abundant at Cape York, lat. 76° , breeding amongst loose detritus at the base of high cliffs. Here the Esquimaux build little piles of stones in which these birds are induced to lay their eggs; these structures, and quantities of the birds' bones strewn about, gave evidence of the nature of these "Arctic Highlanders" food, who were then chiefly away hunting. At this date the young birds were just leaving their nests for the water. On the 28th July, myriads of Little Auks were congregated about their chief breeding-place at Port Foulke. They were not in the least alarmed by visitors, and their incessant chattering as we scrambled down amongst them was deafening. They fly in such close bands as to obstruct the light at times, and settle down in such compact masses that, unless seen to alight, it would be impossible, even at a short gunshot range, to distinguish the crowd of birds from the rock on which they have settled. Foulke Fiord, lat. $78^{\circ} 18'$, is probably their most northern breeding-place. In 1876 I saw a few Little Auks on the 1st September at Cape Hawke, in lat. $79^{\circ} 30'$. The flesh of these birds was highly esteemed when made into a pie for the ward-room mess.

RAZORBILL, *Alca torda*.—A few pairs were breeding in Svarte Vogel Bay in July, 1875, when I obtained a couple of eggs. I met with no Razorbills north of this point.

CORMORANT, *Phalacrocorax carbo*.—I gathered a few eggs of the Cormorant with those of the last species, in lat. $69^{\circ} 42'$. There were from twenty to thirty pairs breeding at the cliffs near to the ridge overlooking the Itifdliarsuk Glacier.

LONG-TAILED DUCK, *Harelda glacialis*.—At Disco, lat. $69^{\circ} 14'$, a couple of pairs of this species were breeding by Blase Dalen Lake in the beginning of July, 1875. The parent birds were obtained, but I was unable to discover their nests. These ducks were very wary and, upon my first visit to the lake, would admit of no approach, keeping upon a central floating sheet of ice which was inaccessible, or flying out of range. Two days afterwards, however, I planned an expedition against them, and, having carried a "collapsible" boat to the spot, we shot them all. On

the 14th June, 1876, two Long-tailed Ducks were shot in Discovery Bay; a couple of pairs bred in the neighbourhood, but I could never find their nests, though the peculiarly deep "quawk" of the male often attracted me to the search. They appeared to be breeding inland, but at no great distance from the sea. Six were obtained in the vicinity of Discovery Bay.

EIDER DUCK, *Somateria mollissima*.—I have been obliged to omit several notes upon this and the following species, from not being certain to which they belonged. In the cases adduced the birds were, however, thoroughly distinguished. The Common Eider bred not uncommonly on Disco Island; both birds and eggs were obtained in July, 1875. On July 23rd a number of pairs were breeding on an island west of Kangitok, lat. $72^{\circ} 48'$. On the 30th July I shot two Eiders and obtained four eggs upon Brevoort Island, off Cape Sabine, in lat. $78^{\circ} 45'$. On August 4th there were many Eiders in Hayes Sound (Buchanan Straits), in lat. $78^{\circ} 52'$, and on the 11th old and young birds were frequent at Walrus Island, lat. $79^{\circ} 25'$. In Discovery Bay two Eiders were shot as late as the first week of September, 1875. In 1876 a couple of pairs were found breeding in Musk-ox Bay upon the 23rd June. Several were shot from that date on, and by the 8th and 9th August Eiders had gathered for migration in flocks of from twenty to thirty. On the homeward journey I observed several Eiders, the last seen being upon the 7th September at Walrus Island. Dr. Coppinger and Lieut. Beaumont obtained three of this species and saw several more in Polaris Bay in the month of July, 1876.

KING DUCK, *Somateria spectabilis*.—Several King Ducks were shot near Disco, lat. $69^{\circ} 14'$. Here they breed chiefly upon the mainland, from which I obtained their eggs. On the 3rd July, 1876, King Ducks were shot in Discovery Bay, and on the 16th, a female was shot whose breast was plucked bare. At the end of this month several of this species were seen and obtained upon Bellot Island, lat. $81^{\circ} 40'$. This species was, perhaps, commoner than the last in Discovery Bay; on the other hand, Dr. Coppinger considered the Common Eider the most plentiful of the two in Polaris Bay upon the opposite coast. Stomachs of both this and the last species examined were generally found to contain shrimps. Three King Ducks were obtained in Polaris Bay in July, 1876.

BRENT GOOSE, *Bernicla brenta*.—I first saw Brent Geese on the 7th June, 1876, in St. Patrick's Bay, lat. $81^{\circ} 48'$, when a pair came to breed. Numbers arrived in the following fortnight, feeding inland and frequenting muddy places by slushy torrents and ponds formed by the melting snow. Shoots of *Eriophorum*, *Ranunculus*, and *Cerastium* were the chief ingredients in their food. On the 24th June I found three nests in Musk-ox Valley; two had five eggs and one had two. Subsequently I found many nests; five eggs was their regular number, though they occasionally hatched two or three. The eggs of the Brent Goose are perfectly delicious eating. The nest consisted of a layer of a couple or three inches thick, of leaves, tops, and shoots of plants, placed on the open ground, with a bed of down above from the female's breast, which is plucked bare. By the beginning of July young Geese were on the water, and at the commencement of August they were easily knocked over in a half-fledged condition, while looking for food by muddy places near the sea. The female Brent Goose sits closely, the male keeping watch close by, and leaving when the visitor is about a hundred yards off; the female leaves when the nest is approached within ten or twenty yards, generally running instead of flying, although there is no means of concealment. It was a painful duty to shoot these, as well as other breeding birds, to supply our scurvy-stricken comrades with fresh food. The Brent Goose is, however, excellent eating, and was preferred on board H.M.S. 'Discovery' to all other Arctic game, and with us the term "game" included the entire list of birds and quadrupeds met with in Discovery Bay; even the Fox was highly appreciated. A few Brent Geese made their appearance in Polaris Bay, every one of which Dr. Coppinger informed me were shot for his invalids in July, 1876.

ROCK PTARMIGAN.—On page 128, I made a mistake in stating that Dr. Coppinger did not observe this bird at Polaris Bay. Upon referring to my game-list, I find that four were killed during July, 1876, by Lieut. Beaumont's party, to which Dr. Coppinger was attached.

ON THE EXTINCTION OF THE BEAVER IN LIVONIA.

FROM THE GERMAN OF OSKAR VON LOEWIS.*

In the last century Beavers were not unfrequently found on many of the rivers of Livonia, especially on the Middle Aa. About 150 years ago they built in the north of Livonia, on the Pernau and its tributaries, and occasionally on the Embach, but especially in Central Livonia, on the Aa and in Sedde. They may also have occurred in Salis, and on the Duna and its tributaries, the Oger, Perse, and Erst, in the southern part of our province. We have it on the authority of Fischer, that colonies actually existed at that time. In his 'Versuch Einer Naturgeschichte Livlands,' 1871, he states, that in the year 1724 the Beaver-colonies built dams of great height, and thereby largely increased the inundations.

That the Beaver was formerly well-known in these parts is shown by the number of places in the Lettish part of Livonia that are named after it; for instance, the Beaverbeck and Beaver-court estates; again, Beaver-birchwood, Beaver-brook, Beaver-hill, &c. Bebris, or Beaver, is not uncommon as a surname among the Letts.

Until the end of the last century the inhabitants of Sedde supplied castoreum to the druggists at Fellin, and so late as 1830 it was obtained from Walk, in the Aa district. But, so far as my investigations have gone, since the year 1818 the Beaver seems to have frequented only the Middle Aa. Solitary individuals may perhaps have strayed into other parts, but this is doubtful, since the Aa district of Walk is the only place where there is positive evidence of their occurrence. And indeed this northernmost stretch of the Aa furnished the conditions best adapted for the protection and continued residence of this much-persecuted and defenceless animal. The stately River Aa here flows for more than fifty versts almost entirely through great lonely forests and occasional meadows; the five or six sparsely inhabited colonies and ferry-stations on the river bank cannot make head against the original wilderness. The shores of the swift-flowing, generally smooth-bottomed Aa, are composed of loose sand. Backwaters of great extent occur frequently; quiet pools; and here and there

* "Das Aussterben des Bibers in Livland," von Oskar v. Loewis. 'Der Zoologische Garten,' December, 1878. pp. 353-357.

the stream is divided by islands. At high tide these backwaters become united with the main stream. In time of flood the Aa inundates the district round for a verst or more, and forests meadows, pools, &c., are united into one vast lake. In former times the flooding of the river was no doubt greatly increased by the numerous Beaver-dams. Thus undisturbed, and with natural surroundings most favourable to their mode of life, the Beavers lived securely.

Many of the old inhabitants assured me, some years ago, that Beavers used, within their recollection, to appear frequently on the Luhde-Trikatenish Aa. They had themselves seen and hunted them, and had admired the felled trees, gnawed into conical points; the Beavers making use chiefly of the aspen, willow, lime, and maple.

In 1818 the ignorant peasants—poachers, in fact—used to sell the castoreum to the druggists at Walk for absurdly low prices; for example, the druggist Rücker, who is still living, paid for one loth (equal to half an ounce) of castoreum, one rouble, 27-28 copecks, silver money.*

But their doom was approaching with giant strides the happy Beavers of the Aa. The druggists of Dorpat, Wolmar, Fellin, &c., sent large orders to Walk at high prices. This encouraged the evil doing of the poacher—and at that time every peasant was one. Every man who could obtain a trap or a gun went, in his leisure time, to the woods by the romantically situated Aa. It was only possible to shoot the Beavers at night; and consequently whilst bad shots, with worse fire-arms, killed but few in the darkness, they nevertheless wounded a great many, and these died miserably and painfully in the wilderness, to the benefit of no one.

It seems almost incredible that not a single magistrate, land-owner, or other authority, should have taken notice of these senseless and barbarous doings; that no one should have put a stop to this wasteful massacre, this extermination of a creature already too rare. In the course of twelve years, through base love of gain and unheard of carelessness, even the few remaining Livonian Beavers were utterly destroyed. In 1832, after an interval of two years, the druggists at Walk received the last pair of castoreum-sacs from indigenous Beavers; the weight of this pair was twenty-two loth, and they realised fifteen roubles per loth.

* 100 copecks = 1 rouble = 3 shillings.

The owner had obtained them from a postilion at Stackeln, who had that year trapped the Beavers from which they were taken.

For some years these were believed to be the last representatives of the doomed race, until, in the autumn of 1840, on the estate of Neuhof, in the upper reaches of the Aa, east of Walk, a single Beaver was tracked and hunted, but without success. It had gnawed through strong willow trees, three or four inches thick, in the usual way, for its winter store of food. This Beaver disappeared from Neuhof, and fled from its eager pursuers yet farther up the stream towards the source of the Aa. At length, in the summer of 1841, on the borders of the crown-lands of Aa-hof, this sole surviving Beaver was shot by a gamekeeper, Neppert. It was veritably the last of its race, for since then diligent inquiry has revealed no traces of any Beavers in Livonia.

By consulting the account-books of the druggists, and noting the prices of castoreum, a thoughtful observer might have foretold the gradual destruction and final extinction of the Beavers. For example, at Fellin, the price of castoreum per ounce was, in 1776, 60 cop.; 1777, 1 r. 80 cop.; 1801, 3 r.; 1802, 3 r. 75 cop.; 1804, 4 r. 33 cop.; 1805, 5 r. 50 cop.; 1807, 5 r. 71 cop.; 1830, 14 r.; the supply constantly diminishing, until at length foreign or Siberian castoreum was worth forty roubles per ounce.

The demand failing, the high prices gradually fell, till in 1876 it was twelve roubles an ounce.

Strange to say, skins of the Livonian Beavers were not highly prized, and at most were only used by hatters; perhaps because the Beavers were almost always taken in summer, and the fur would not have attained its full beauty until the winter. The meat was utterly despised, and thrown away as unfit for use. Thus, neither fur nor flesh was the object of this deplorable destruction, the sole cause of which was the rapid rise in the value of castoreum, then held to be a necessary of life. Had this drug only been earlier replaced by the medicaments which subsequently came into use, the Beaver might to this day have been inhabiting Livonia, even though confined to one district, and protected by strict game-laws and the watchfulness of foresters and landowners. The Beaver is the first mammal of any size which has disappeared from the fauna of Livonia during the present century. Are the Bear, the Lynx, and the Squirrel to follow it before 1900?

OCCASIONAL NOTES.

WILD CAT IN THE WEST HIGHLANDS.—The Wild Cat, *Felis catus*, Linn., though yearly becoming rarer and rarer, is not extinct, I am glad to say, in Loch Aber. It is also occasionally met with in the districts of Arisaig, Moidart, Ardnamurchan [the last killed in Ardnamurchan was in June, 1872], Sunart, Ardgower, and Morven. It has also been met with in recent years in some parts of North Argyleshire, such as Upper Glen-ceran and Glen Duror. It is usually encountered along the face of such rocky steeps as rise above broad beltings of natural woods, such as hazel, birch, &c. It is necessary to observe, however, that with keepers, fox-hunters, and others, all cats killed at a distance from human dwellings are called Wild Cats, though they may only be, as they frequently are, domestic cats that have for some reason taken to the woods and rocks, and become in a manner savage enough and wild enough, though not necessarily Wild Cats in the zoological sense of the term. Mr. Harvie Brown believes that, generally speaking, highland fox-hunters, gamekeepers, foresters, and shepherds, are perfectly conversant with the true Wild Cat; and few, except such as have never seen one alive, would commit the error of mistaking the one for the other. He has great trust in the reports regarding matters of local Natural History, because he has had considerable experience of their practical knowledge of the subject. Many of the highland keepers are good field-naturalists, and their opinions and statements are always worth consideration. Three years ago I saw a Wild Cat, a magnificent specimen, among the rocks in a place called the Dubh-ghlaic, or Black Gully. The fierce barking of my dog at a distance called me to see what was up, and there, on a narrow ledge of rock in the face of a giddy precipice, was a large Wild Cat, with eyes flashing fire, hair erect, and tail thick as my wrist and stiff as a poker, glaring down on my bitch "Lassie," who was baying it from a broader and lower ledge, into which, in her excitement, she had scrambled, and from which, on the disappearance of the cat at my approach, I had some difficulty in rescuing her. About a dozen years ago, a very large Wild Cat was killed in a curious way in my immediate neighbourhood. It was in the spring of the year. One of our crofters with his family had returned from gathering seaweare for manuring the land. Of the four panes in the cottage-window, one was of deal, and made to open and shut at pleasure on leather hinges, a very common arrangement for the purpose of ventilation, as well as for the convenience of the domestic cat when, from any cause, the door is kept shut. Looking through the opening on the occasion referred to, the man saw a strange cat of large size on the hearthstone, in the act of eating a chicken, one of an early spring brood that had been left with the hen by the fireside

when the family left for the seashore labours in the morning. Mackenzie,—such was the crofter's name,—ordering his family to fall back, armed himself with a bludgeon and entered the house by the door, in order to do battle with the cat. To prevent the cat from escaping through the open window, he directed his brother to watch the marauder at that not unlikely point of exit. Now the brother, a big, burly man, was the boat-carpenter of the district, and usually at daily work, though on this particular occasion assisting his brother in sea-ware gathering. The carpenter, be it understood, had on his everyday working trousers, originally of strong pilot cloth, and now all over, particularly about the knees and seat, so covered with layer upon layer of tar that it was stronger and thicker than any tarpaulin. When Mackenzie entered the kitchen and made a stroke at the cat, the latter made a dash at the open window-pane. The carpenter, in his excitement, could think of no better way to prevent the cat's exit than by placing that part of his body on which his trousers were thickest and baggiest right in the opening. The cat made such a vigorous dash at the opening that he got his head between the carpenter's legs, and further he could not get, though he struggled and clawed with all his might, for the carpenter now literally sat upon him, squeezing him firm and fast against the window-sill, which in such cottages is only about two feet from the ground. The well-tarred seat of the carpenter's trousers was strong and stout, as has been said, and it had need to be, for a wild cat's claws hard at work are no joke. The carpenter did not know himself how long they might afford sufficient protection, and he shouted lustily for immediate assistance. Mackenzie came rushing out of the door, bludgeon in hand, and dealt the cat stroke after stroke on the head, the granite window-sill acting as chopping-block, until the cat expired, and the carpenter could at last move away from the window-sill, thankful to have escaped with a few scratches of no great importance, considering how matters might have been had his unmentionables been of slighter and thinner texture. The carcase of this cat, a good deal mutilated by the energy of the bludgeon-work to which it had been subjected, I saw that same afternoon, and can bear witness that it was a veritable Wild Cat, of such monstrous size, too, that Mackenzie avowed that if the kitchen had not been so dark that he could only see the animal imperfectly, and was thus unaware of its hugeness, he never would have ventured a blow at it, and would only have been too glad to allow it to escape scot-free by any exit it chose. Upon the whole, then, a pretty safe conclusion is that, in the West Highland districts mentioned, Wild Cats, though not common, are far from being extinct.—ALEX. STEWART (Ballachulish Manse, Nether Lochaber).

PINE MARTEN IN CUMBERLAND.—A Marten-cat was sent to me on April 2nd, which had been trapped by a gamekeeper at the head of

Miterdale, a little valley running up towards Burnmoor, one of the loneliest and wildest parts of the district. It was an adult female Pine Marten, *Martes sylvatica*, not yet pregnant, measuring two feet three inches and a half from the nose to the tip of the tail. The breast-spot was white, with the faintest possible tinge of yellow at the centre. A Stoat was trapped in Murthwaite Wood, Gosforth, on March 1st, which was white, with the exception of the top of the head, back of the neck, and a faint line about a quarter of an inch broad running down the backbone. The tip of the tail was black as usual.—CHARLES A. PARKER (Gosforth, Carnforth).

WHITE-BEAKED DOLPHIN.—A young female of this species (*Delphinus albirostris*) was landed at Yarmouth on March 22nd from one of the herring-boats which had been fishing somewhere in the English Channel. The man who exhibited it in the Norwich Townland Fair, where I saw it, said, "off Cornwall," but was not very sure. In colour it very closely resembled the specimen recorded in 'The Zoologist' for 1879 (p. 421), but was rather larger, measuring in total length five feet, the other dimensions being in proportion.—T. SOUTHWELL (Norwich).

LONG-EARED OWLS IN GUERNSEY.—I have had several notes from correspondents in this island on the unusual number of Long-eared Owls which made their appearance there during the last autumn and winter. At first I thought there might be some mistake as to identity, and that the birds seen and shot were Short-eared Owls, which are always common there in the autumn. Accordingly I wrote to Mr. Jago, the birdstuffer at St. Peter's Port, to send me a skin of one of the owls of which he had had so many. He did so, and it turned out to be a Long-eared Owl, and with it he sent a note saying that Long-eared Owls had been very numerous that winter, and he had had many through his hands. He added, "The first I received was purchased by a lady in the market on November 8th, and a few days afterwards I received two from Herm; the following week I had nine brought to me. The Herm keeper shot two shortly after the first, and he then told me he could shoot a dozen any morning he liked. The last I received was shot on February 5th, making about thirty that have passed through my hands. I also know of many being killed that have not been brought to me." Undoubtedly this shows that a large migratory flock of Long-eared Owls visited the islands this winter, as the Long-eared Owl is usually by no means a common bird in the Channel Islands, and I was previously aware of the occurrence of few examples. Short-eared Owls, I believe, were seen in their usual numbers last autumn, Mr. Jago in his letter remarking that he had had about the usual number through his hands.—CECIL SMITH (Bishop's Lydeard, Taunton).

ICELAND GULL AND OTHER SEA-BIRDS IN WEST CUMBERLAND.—An immature Iceland Gull was shot near the mouth of the River Calder on February 20th last. It was a male, in its second year. The storms at the end of the month were very destructive to the smaller sea-birds. I myself picked up twenty Razorbills, eight Guillemots, and a Manx Shearwater in the course of a three miles' walk along the shore. I always find some of these birds dead in February; probably they are overtaken and drowned by storms when fatigued on their journey northwards.—CHARLES A. PARKER (Gosforth, Carnforth).

BLACK REDSTART IN CO. WATERFORD.—On March 26th a specimen of the Black Redstart was captured here within one mile of Waterford city. It is a young male bird, not having yet attained the full plumage, and is now in the possession of Dr. Burkitt, of Waterford, who added a specimen of this bird to his collection about forty years ago. I believe the occurrence of the Black Redstart in Ireland has not been often noticed.—E. A. WHITE (Summerville, Waterford).

[Several Irish specimens are mentioned by Thompson in his 'Birds of Ireland,' including the one in Dr. Burkitt's collection, which was shot near Wexford in February, 1836.—ED.]

VARIETY OF THE STARLING.—A hen Starling was shot in Gosforth parish on March 16th which had all the large tail-feathers and primaries of both wings of a dull white. The secondaries were tinged with very light brown and the whole body a dull brownish grey, the spots being very faint. The head was the darkest portion of the bird, but even that was much lighter-coloured than usual. Altogether it had quite a washed-out appearance.—CHARLES A. PARKER (Gosforth, Carnforth).

PEREGRINE FALCON IN BEDFORDSHIRE.—I regret to say a female Peregrine was shot in the neighbourhood of Bedford on April 3rd. Mr. Covington, the birdstuffer, showed it to me the following day, and, on dissection, I found the ovaries to contain eggs about the size of hemp-seed. It was, strange to say, like most of the Peregrines shot lately, exceedingly fat.—C. MATTHEW PRIOR (Bedford).

GREEN WOODPECKER IN SOMERSET.—I cannot agree with the editorial remark on this subject in the April number of 'The Zoologist' (p. 149), that the unusual number of Green Woodpeckers which have found their way into the shop of Mr. Petherick, the birdstuffer at Taunton, "seems to indicate a migratory movement towards the south-west on the part of this species." It seems to me to be perfectly accounted for by the late unusually hard winter, when there was but little work to be done on the

farm, or elsewhere out of doors, and no hunting; in fact, there was no outdoor work, and little or no outdoor amusement but skating or shooting. Consequently, many of those who did not skate wandered about with a gun, looking for snipe, or duck, or anything that might turn up; and the Green Woodpecker, being a fine, handsome, conspicuous bird, and easily shot, fell a victim to the numerous shooters, and, owing to its beauty, found its way to the birdstuffers in greater numbers than other less conspicuous victims. Had there been any large migration as suggested, more would have been seen about than has been the case. But the fact is, as might be supposed from the slaughter, I have seen fewer about than usual, and the numbers in the bird-shops seem greatly to have diminished the usual numbers of these handsome birds about us. I have not seen a single Green Woodpecker about my own place or in the neighbourhood during the whole of this winter and spring, and they are generally tolerably common just about here. There was a considerable destruction of these birds the winter before last, but not so great as during the past winter, when, as I have elsewhere remarked, this wholesale destruction of Green Woodpeckers almost threatened the extermination of the species, and made one wish that the provisions of the Bird Act might be extended to this particular bird throughout the whole year instead of during the close season only.—CECIL SMITH (Bishop's Lydeard, Taunton).

BITTERN IN WEST CUMBERLAND.—A Bittern was shot in the winter of 1873 on Sellafield Tarn, in Beckermet parish. It had alighted amongst the bulrushes, and had it not been wantonly destroyed would probably have remained about the tarn, which is exactly the kind of place it would naturally haunt in company with the Coots and Mallards. Another was shot the following winter on the River Calder, about a quarter of a mile from the tarn. In 1876 a third was killed close to Wreay Castle, Windermere, by Mr. D. Ainsworth. A fourth, in 1879, was shot at Braystones Tarn, about a mile and a half from Sellafield. Some years ago a fifth was shot by Mr. Vickers, of Birkby Crag, as it flew over his yard in the dusk. It is a great pity that this beautiful and interesting bird is never allowed a chance of remaining where it would probably breed, were it not so uniformly persecuted.—CHARLES A. PARKER (Gosforth, Carnforth).

TESTACELLA HALIOTIDEA IN SUSSEX.—In his “ Catalogue of the Land and Fresh-water Mollusca of Sussex ” (Zool. 1878, p. 87), the Editor remarks:—“ It is somewhat curious that none of the Sussex conchologists have included in their lists the Shell Slug, *Testacella haliotidea*, which is apparently not found on the chalk soil, or sand, although it is not very

uncommon on the London clay." I have now to report that it occurs plentifully in the nursery-gardens of Miss Allman, at Horsham, from whence, last autumn, I received many specimens of all ages.—WILLIAM BORRER (Cowfold, Sussex).

[Probably imported in earth adhering to the roots of plants.—ED.]

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

LINNEAN SOCIETY OF LONDON.

March 4, 1880.—Prof. ALLMAN, F.R.S., President, in the chair.

The following gentlemen were elected Fellows of the Society:—S. M. Bairstow (Huddersfield), John T. Carrington (Aquarium, Westminster), Prof. P. M. Duncan (King's College, Lond.), R. M. Middleton, jun. (West Hartlepool), S. O. Ridley (British Museum), and J. Charters White (Belgrave Road, S.W.).

Mr. Middleton exhibited two skulls of *Babirussa alfurus*, Less., from Borneo, which, though quite adult, were both distinguished by the remarkable smallness of their tusks.

Dr. A. Günther brought forward two deep-sea fishes obtained during the 'Challenger' Expedition, viz. *Echiodon* and *Scopelus*, to illustrate two kinds of luminous metameric organs, first distinguished by Dr. Usson, which he described and designated as the "lenticular" and "glandular" kinds. Whilst admitting the great morphological resemblance of the former to an eye, he (Dr. Günther) gave reasons which induce him to dissent from the view that they are organs of vision. He showed that their structure is not opposed to the view that they, like the glandular kind, are producers of light, and that probably this production of luminosity or light is subject to the will of the fish.

Mr. J. Jenner Weir, on behalf of Mr. Edward A. Nevill, showed the stuffed head of a Prongbuck (*Antilocapra americana*), shot by the latter in the Rocky Mountains, August, 1876. On the median nasal region of this specimen what appeared to be a short unbranched third horn was developed. In the discussion which followed it was suggested that the abnormality in question might be an elongated warty growth rather than a true horn, after the type of the rear horns. A further careful examination into its structural conditions was recommended.

Dr. Francis Day next recounted the peculiarities and descended on the geographical distribution of the Hebridal Argentine (*Argentina Hebridica*). Only three examples have hitherto been recorded (all by Yarrell) as taken in Britain, viz., two in Rothesay Bay, Scotland, and the third off Redcar,

Yorkshire. Dr. Day's fourth specimen was got off the Island of Skye. This Argentine, nevertheless, extends from Norway to the Mediterranean, being found in the latter all the year round, and is stated to be a deep-sea fish. Besides its rarity in British seas, a further interest is attached in the fact that Mr. Clarke has figured and described a new species, *A. decagon*, as inhabiting New Zealand; but his unique example, in all essential particulars, agrees with the European species. Has the latter, therefore, such a wide geographical range is a problem yet to be solved?

March 18.—Prof. ALLMAN, F.R.S., President, in the chair.

Messrs. W. Duckenfield Scott (Wimbledon) and Wardlaw Ramsay (Portsmouth) were elected Fellows of the Society.

The President said that before entering on the ordinary business of the meeting, it became his melancholy duty to announce the death of Professor Thomas Bell, at the age of eighty-seven. Prof. Bell was the oldest Fellow of the Society, having been elected into it in 1815. He had held the Presidential Chair for many years, and under his judicious and able guidance the Society had marvellously advanced in prosperity. He was a distinguished zoologist, and by his researches had largely advanced our knowledge of the Fauna of the British Isles. His labours have left their mark on the Zoology of Britain, and it is hard to say who can take his place in the department of Natural History in which he had shown himself so loving and conscientious an observer. He was known personally to many present, and by reputation to all of us, and the meeting will receive with sorrow the sad announcement that he has his place no longer among the Fellows.

There was exhibited, for Mr. John T. Carrington, a male and female example of the Northern Stone Crab (*Lithodes arctica*), which had lived in the Westminster Aquarium. The peculiar symmetry of the abdominal segments in the female was adverted to, and for this and other reasons an affinity with the Hermit Crabs pointed out.

In the absence of the author, the Secretary read a communication from Prof. Westwood, "On a supposed Polymorphic Butterfly from India." The author observed that when a species is connected with problems of biological interest,—such as modifications it may undergo through variations of food, of temperature, and of geographical distribution, or the possibility of two or more species being proved to be only dimorphic or polymorphic forms of a single species,—the investigation assumes a sufficiently widened interest to warrant ample discussion. Proceeding on this basis, he discussed the peculiarities of two supposed species of Lepidoptera, *Papilio Castor* and *P. Pollux*, from Assam and Silhet. He admitted that the variation in size and marking of the sexes of the same species of the genus *Papilio* is puzzling. As regards *P. Castor* and *P. Pollux*, he showed that authors are

by no means unanimous respecting them. Furthermore, that the question is rendered more complicated by the occurrence of a singular gynandromorphous specimen of *P. Pollux* in the collection of Mr. Semper, of Altona. From the evidence given, to admit the conclusion that *P. Castor* is the male of *P. Pollux*, as has been suggested, we should be obliged to admit not only that the female in this species is dimorphic, but also that the same thing occurs in the male. Taking all into consideration, Prof. Westwood summarises and is in favour, 1st, of *P. Castor* being males of a species whose females have not been discovered; 2nd, that the typical *P. Pollux* are females, of which the male with rounded hind wings having a diffused row of markings has yet to be discovered; and 3rd, that the coloured figures given by the author represent the two sexes of a dimorphic form of the species.

April 1, 1880.—Prof. ALLMAN, F.R.S., President, in the chair.

Only two short zoological papers were read, *viz.* :—“Description of a new Genus of Moth (*Pyramocera*) of the Family *Liparidae* from Madagascar,” by Mr. Arthur G. Butler; and “Notice of Marine Crustaceans collected by Mr. P. Geddes at Vera Cruz,” by Mr. Edward J. Miers. The Vera Cruz Crustacea include—a female and immature male of a species of *Panopeus*; examples of *Pachygrapsus socius*, Stimpson, which is very probably merely a variety of *P. transversus*, as it is distinguished only by the absence of the dark patch on the immobile finger, which is always present in the typical *P. transversus*; and a series of females of a species of *Pinnotheres*, possibly the *P. angelicus* of Lockington.

April 15, 1880.—The Rev. G. HENSLOW, F.L.S., in the chair.

Mr. S. A. Wintle (of George Bay, Tasmania) was elected a Fellow of the Society.

The Secretary read a paper, for the Rev. R. Boog Watson, “On the Mollusca of the ‘Challenger’ Expedition” (part 5), in which the writer observed that temperature, even more than depth, seems an important condition in molluscan life, while both prove barriers to distribution, though great length of time naturally helps escape from these barriers. Where depth and temperature do not check distribution there is no limit to universality of distribution, and such is the case with certain existing species; still there is no trace of special, lasting and progressive change. Mr. Watson has described some thirty-five species, nearly all of which are new forms, and belong respectively to the families *Solenoconchia*, *Trochida*, *Rissoellidae*, *Littorinidae* and *Cerithiidae*.

Prof. F. Jeffrey Bell read a note on an abnormal (quadriradiate) specimen of *Amblypneustes formosus*, and afterwards Mr. Charles Stewart exhibited and made remarks on another but differently abnormal specimen of the same

species. Prof. Bell, after a full description, observed that, with more or less reason, some naturalists have looked on the possession of other than five rays as a character of some specific value among the *Asterida* and *Ophiurida*, and have considered that, on account of its greater rarity among the latter, it is of greater value as a mark of distinction; but such a view must be taken with considerable limitation. The pentamerous arrangement of parts in the regular *Echinoidea* is only disturbed in one example; information and specimens are, however, at hand to show how this may have happened. The rarity of any divergence from this five-part division, in face of the numerous variations which occur in other *Echinodermata*, will doubtless become more and more important as a factor in determining the genealogical history of the group.

A series of microscopical sections of pearls, exhibiting many irregularities in structural detail, were shown by Dr. Murie, and their several peculiarities explained.—J. MURIE.

ZOOLOGICAL SOCIETY OF LONDON.

March 16, 1880.—Dr. A. GUNTHER, F.R.S., Vice-President, in the chair.

The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February, and called special attention to several novelties, amongst which were two female Thars (*Capra jemlaica*), mother and young, presented by H.R.H. the Prince of Wales on the 5th February; and two Burrhel Wild Sheep (*Ovis burrhel*), purchased February 19th.

Mr. W. K. Parker exhibited and made remarks on the eggs and embryos of some Crocodiles (*Crocodilus palustris*), obtained in Ceylon by Dr. W. R. Kynsey, Principal Medical Officer of Colombo.

Mr. W. A. Forbes read a paper on some points in the anatomy of the Sumatran Rhinoceros.

Mr. Edward R. Alston exhibited and made remarks on a coloured drawing of an adolescent specimen of *Tapirus Dowi*, now in the Paris Museum.

Mr. Alston also exhibited a specimen of a remarkable and little-known Australian Marsupial, *Antechinomys lanigera* (Gould).

A communication was read from Mr. L. Taczanowski, giving the descriptions of a collection of birds made in Northern Peru by Mr. Stolzmann during the last months of 1878 and the first half of 1879. Amongst them were examples of three species believed to be new to science, and proposed to be called *Turdus maranonicus*, *Arremon nigriceps*, and *Colaptes Stolzmanni*.

Mr. Alfred E. Craven read descriptions of three new species of Land and Fresh-water Shells, from Nossi-Bé Island, N.W. Coast of Madagascar.

Mr. Craven also read a paper on a collection of Land and Fresh-water Shells, made during a short expedition to the Usambara Country, in Eastern Africa, with descriptions of seven new species.

Mr. F. Jeffrey Bell read some remarks in reference to certain statements made by Mr. A. Agassiz, in a paper on the synonymy of the *Echini*, communicated to the Society at a previous meeting.

Mr. W. K. Parker read a paper on the structure of the skull in the Chameleons.

April 6, 1880.—Prof. FLOWER, LL.D., F.R.S., President, in the chair.

The Secretary read some extracts from letters which he had received from Mr. W. A. Conklin, of New York, relating to the birth of an Elephant, which had lately taken place in a travelling menagerie at Philadelphia.

Prof. T. H. Huxley read a paper on the distinctive characters of the species of the genus *Canis*, as shown in certain points of the structure of their skulls and in the proportions of their teeth.

Dr Francis Day read a paper on the Fishes of Afghanistan, based principally upon a collection which had been made for him, in the highlands of Kelat and Quettah, by Dr. Duke.

A communication was read by Prof. Julius Von Haast, containing a description of a specimen of a rare Ziphoid Whale (*Epiodon novæ-zealandiæ*), which had been cast ashore at New Brighton, in July, 1878.—P. L. SCLATER, *Secretary*.

ENTOMOLOGICAL SOCIETY OF LONDON.

February 4, 1880.—J. W. DUNNING, M.A., F.L.S., Vice-President, in the chair.

The Secretary, on behalf of the President, nominated Mr. H. W. Bates, Mr. J. W. Dunning, and Mr. H. T. Stainton, Vice-Presidents for 1880.

Mr. Patrick F. Copland, of Hillecote, Buckhurst Hill, Essex, was ballotted for and elected a Member. Mr. John B. Bridgman, of 69, St. Giles Street, Norwich, and Mr. Peter Cowell, Librarian of the Free Public Library, William Brown Street, Liverpool, were ballotted for and elected Subscribers.

Mr. H. T. Stainton exhibited, on behalf of Mr. Grigg, of Bristol, a specimen of *Heliothis scutosa*, captured near Weston-super-Mare.

Mr. F. P. Pascoe exhibited a specimen of the common "fire-fly" of the Amazon Valley (*Aspisoma lineatum*), a species not mentioned by Messrs. Bates and Wallace. It has the usual intermittent light, flashing at intervals of about two seconds; but Mr. Pascoe believed, contrary to the general

opinion, that the insect was capable of withholding the light for an indefinite time, as he found that when alarmed they at once disappeared. Mr. Pascoe remarked that it would be very desirable that entomologists abroad should pay some attention to these "fire-flies"; they seem to vary in different localities. Mr. M'Lachlan had just told him that he had been informed when in Sydney that in the country to the north the "fire-fly" was a Dipterous insect.

The Rev. H. S. Gorham stated that the term "fire-fly" was applied to all luminous insects indiscriminately. In the district where Mr. Pascoe's specimen occurred there were perhaps fifty species of highly phosphorescent Coleoptera. With regard to our species, *Lampyris noctiluca*, he did not think that the insect had the power of suddenly withdrawing its light, having often handled and irritated them with a view to the experiment. He was of opinion that the light of the female *L. noctiluca* is certainly brighter when the insect is unimpregnated; after which it ceases to be so brilliant. Mr. Gorham believed that the so-called "flashing" was often simply due to the creature crawling over leaves and herbage, and thus exposing the ventral surface only at times.

Mr. M'Lachlan remarked that the subject of the simultaneous flashing of fire-flies had been brought under the notice of the Society in 1865 by the Rev. Hamlet Clark (see Proc. Ent. Soc., ser. iii., vol. ii., pp. 94, 101), and that he had at that time advanced the opinion that the phenomenon in question might be caused by currents of air inducing the insects to simultaneously change their direction of flight. He was of opinion that the common glow-worm was not capable of extinguishing its light when alarmed, as he had captured large numbers in a net at the same time, the insects nevertheless continuing to shine.

Mr. Osbert Salvin stated that in the Central American region he had observed that a luminous Elaterid, *Pyrophorus*, had a *straight* flight.

Sir Sidney Saunders stated that in the South of Europe (Corfu and Albania) the simultaneous flashing of *Luciola italica*, with intervals of complete darkness for some seconds, was constantly witnessed in the calm summer nights, when swarming myriads were to be seen far and near obeying this peculiar instinct of their race. He did not concur in the hypothesis propounded by Mr. M'Lachlan, that currents of air might induce a number of these insects simultaneously to change the direction of their flight, and thereby occasion a momentary concealment of their light, which would seem to imply a continuous luminosity, casually occulted; whereas the flashes are certainly intermittent, as shown by the difficulty experienced in capturing a specimen flying in the open, close at hand, when the flash becomes extinguished before the object can be attained, to be renewed for an instant at the distance of several feet. The simultaneous character of these coruscations, among vast swarms, would seem to depend upon an

intuitive impulse to emit their light at certain intervals as a protective influence, which intervals became assimilated to each other by imitative emulation. But whatever the inciting causes of the phenomenon, he affirmed that the fact itself was incontestable, and a frequent subject of remark by all observers there.

Mr. Jenner Weir said that he had noticed that when a glow-worm was captured, the light began gradually to diminish in intensity, but did not quite cease to be visible.

Mr. Meldola remarked that when in Ceylon, in 1875, he had captured numerous specimens of a Lampyrid (*Luciola respertina*, Fab. = *Calophotia perplexa*, Walker), which was swarming everywhere over bushes and tall grass. The flight of the species was *straight*, and the insects did not fly in gregarious swarms. When captured and put in a box it gradually diminished the intensity of its light in the manner described by Mr. Weir, but if left undisturbed, was soon glowing with full brilliancy. Mr. Meldola observed, in conclusion, that the exact nature of the phosphorescence was still an unsolved problem, interesting both to the physicist and biologist. Some years ago he had examined the spectrum of the glow-worm, and found that it was continuous, being rich in blue and green rays, and comparatively poor in red and yellow.

Mr. Pascoe also exhibited the two sexes of *Isopogon hottentottus*, a Dipterous insect, which he was informed by Mr. R. W. Meade, of Bradford, had been hitherto unrecorded in this country. Above a dozen were seen gamboling in the air in a confined space among some yew trees at Box Hill, occasionally settling on the leaves. When he had taken four or five specimens the remainder, probably alarmed, disappeared. He remarked that the members of the family to which this fly belongs (*Asilidae*) are generally solitary in their habits, alighting on the ground in some pathway or open spot, then darting off a short distance. They are perhaps the most daring and ferocious of all insects; they have even been known to pounce upon and carry off a tiger-beetle (*Cicindela*).

The Secretary exhibited, on behalf of Mr. George Francis, of Adelaide, specimens of a South Australian moth (*Anapaea*, sp.?), which feeds on the native *Eucalypti*. (See Proc. Ent. Soc. 1879, p. xv).

Mr. Meldola read the following note "On the Protective Attitude of the Caterpillar of the Lobster Moth":—

"Most entomologists have admitted that the grotesque attitude of those caterpillars forming Newman's 'Cuspidate' group was in some way protective, but it is only quite recently that Dr. Hermann Müller has made known ('Kosmos,' Nov. 1879, p. 123) the results of his observations on the caterpillar of *Stauropus Fagi*, which observations now for the first time tend to show the true meaning of this attitude in the species in question. When sitting on a twig in its natural position the head and first five segments

are held erect, and the greatly lengthened legs of the second and third segments held outstretched; thus, when seen from the front, the whole aspect of the insect, both in form and colour, is most spider-like, and when alarmed it immediately raises its four long legs and moves them irregularly, after the manner of a spider attacking its victim. This spider-like appearance is believed to be a special protection against ichneumons which may approach it from the front. According to the experience of H. Müller ichneumons are especially afraid of spiders, and he states, on the authority of Fleddermann, an experienced breeder of insects, that the larva of *S. Fagi* was never found to be attacked by ichneumons, whilst, according to Treitschke, the nearly allied *Hypocampa Milhauseri* is often attacked by them, although a much rarer species, which rarity may perhaps be attributable to the complete absence of such protection as that possessed by *Stauropus Fagi*. When approached from the rear there is nothing to be seen but the erect, hard, shield-like surface of the last segment surmounted by two black horns, and presenting an appearance totally unlike that of a caterpillar. When a side-view of the larva is presented there is seen on the fourth and fifth segments a small black depression just below the spiracles, and giving the appearance of a caterpillar which has already been stung by an ichneumon, so that one of these foes approaching from the side would be deceived and abandon it without depositing its eggs."

Mr. S. Stevens stated that, having recently reared several specimens of *S. Fagi*, he could confirm the opinion of Dr. H. Müller as to the spider-like appearance of the larva.

The Rev. H. S. Gorham communicated a continuation of his "Materials for a Revision of the *Lampyridæ*," the present paper treating of the genus *Photinus*; and Dr. Sharp communicated a paper entitled "On some Coleoptera from the Hawaiian Islands."

March 3, 1880.—H. T. STANTON, F.R.S., &c., Vice-President, in the chair.

Dr. Henry Charles Lang, of 41, Berners Street, Oxford Street, and Mr. Frank Crosbie, of The Chestnuts, Barnet, Herts, were ballotted for and elected Ordinary Members.

Mr. F. P. Pascoe exhibited several species of scorpions *à propos* of a controversy which has recently been going on in 'Nature,' respecting a statement that scorpions are in the habit of stinging themselves to death when in the midst of a circle of fire from which they are unable to escape. He pointed out that the two common European species, *Scorpio europaeus* and *Buthus occitanus*, were almost physically incapable of reaching a vital part owing to the shortness of the tail or post-abdomen, and thought there must be some error of observation with those who asserted the contrary. From his own experience, he believed that scorpions were only

able to strike backwards and a little upwards. In some forms with very long tails, such as *Lychas*, &c., it might be quite possible for the animal to insert its "sting" into the soft parts between the segments; but he thought it was questionable whether, in this mild way, any poisonous matter would be ejected. Another difficulty was that when the tail was so bent back the convexity of the sting would be downwards, and consequently its point would be upwards and away from the cephalothorax.

Mr. S. Stevens exhibited, on behalf of Mr. Pim (who was present as a visitor), a dwarfed female specimen of *Plebeius Icarus* (*Lycæna Alexis*).

The Rev. A. E. Eaton exhibited three plates of drawings of *Ephemeridae*, showing the structural details of the species represented.

The Secretary exhibited, on behalf of Mr. George Francis, of Adelaide, the microscopical specimens referred to at the last meeting, which had been kindly mounted for exhibition by Mr. William Cole.

Mr. Howard Vaughan exhibited a series of *Cidaria russata* from Yorkshire and the Isle of Arran, showing the local variation of this species.

The Rev. H. S. Gorham read a paper on the *Lampyridæ*, in continuation of those communicated at the meetings of December and February last, the present instalment concluding his revision of the genus *Photinus*.

Mr. Gorham also read a paper summing up the results of his observations on the *Lampyridæ*, with respect to their phosphorescence, which he believed to serve the part of a beacon for attracting the sexes to one another. In support of this conclusion he stated that he had found that the eyes of these species were developed in magnitude according to the amount of luminosity displayed. With regard to the typical species of the family, he had observed that in the most highly organized genera, such as *Lamprocera* and *Cladodes*, the light-emitting faculty did not appear to be developed in proportion with the rest of the organs, and that the eyes were also reduced "in a direct ratio with the light," being small and uniform in both sexes, whilst the antennæ were "developed in inverse ratio as the phosphorescence is diminished." In illustration of this supposed correlation between the development of the antennæ and the intensity of the light, Mr. Gorham exhibited a selection of species arranged in three groups.

Mr. Pascoe thought it was much to be regretted that Mr. Gorham had not been able to observe the phosphorescence of some of the exotic *Lampyridæ* in their native haunts, as he had no doubt that many of the opinions now advanced would thus have to be considerably modified.

Sir Sidney Saunders observed that the discussion involved two distinct questions,—namely, the flashing at intervals and the simultaneous action of large numbers in displaying their luminosity,—both of which he considered as indisputable facts. As regards the first, he mentioned the circumstance that when flying past, free from all obstructions, the *Luciola* suddenly emits its light, and then remains untraceable until it repeats its flash at a

distance of some yards, and is therefore difficult to capture unless by overtaking the fugitives and sweeping with a net in the observed direction. They then exhibit a casual glare as they crawl about within. As to the contemporaneous flashes of myriads, such as are more frequently congregated on the calmest nights, surrounding objects, previously involved in obscurity, become suddenly illuminated as if by electricity, and as rapidly plunged in their antecedent gloom at alternate intervals. He could not concur in the hypothesis that currents of air had any connexion with such displays or occultations, when not a breath was stirring around; nor that these manifestations might be evoked by sexual influences, amid vast hosts instigated to combine therein and act in unison. He would rather attribute this phenomenon to an inherent tendency to emit their light from time to time, requiring a certain period of repose to recruit their powers; and when any thus surcharged felt intuitively inspired to take the initiative, the others—prompted to obey a corresponding impulse—followed such example in responsive sequence. He confirmed Mr. Gorham's remarks as to the luminous segments of the abdomen being diaphanous and recognizable, adding that their luminosity was retractile and of a quivering character, with alternations of a golden lustre, differing from the phases exhibited when disporting in mid-air.

The Rev. A. E. Eaton remarked that while the subject of insect luminosity was under discussion, it might be interesting to mention that Dr. Hagen, in a paper published in the 'Transactions' of the Society for 1873 (p. 309), had stated that a species of *Ephemeridae* (*Cænis dimidiata*) had been sent to him by Prof. Zaddach as a luminous insect, two males having been captured at night near Pillau "giving a small blue light."

Mr. Meldola stated that Mr. Thomas Belt, in his well-known 'Naturalist in Nicaragua' (p. 320), had expressed his belief that the luminosity of the *Lampyridæ* played the same part as the bright colours of many caterpillars, *i. e.*, that it served as a danger signal, warning nocturnal foes of the inedibility of the species of this family, which he had found to be generally distasteful to birds, &c. Their immunity from persecution is also testified by the fact that the species of this family are very frequently mimicked by other beetles, and even by insects of other orders.

Mr. C. M. Wakefield communicated a paper by Mr. R. W. Fereday, entitled "Description of a new Species of the Family *Leucanidæ* and a new Species of the Genus *Chlenias*"; Mr. A. G. Butler communicated a paper "On Synonyms of Heterocerous Lepidoptera"; Mr. C. O. Waterhouse communicated "Descriptions of *Cetoniidæ* and *Cerambycidæ* from Madagascar." —R. MELDOLA, Hon. Sec.